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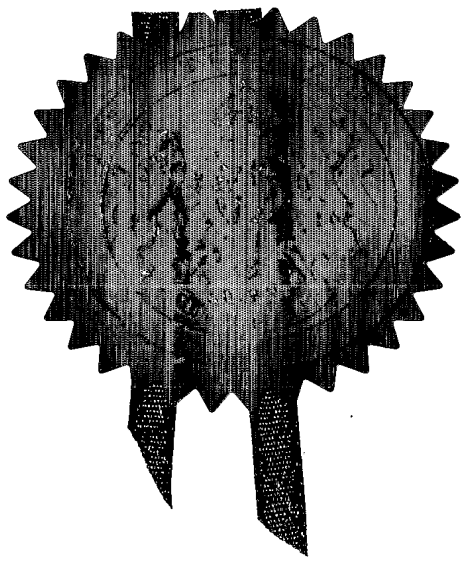

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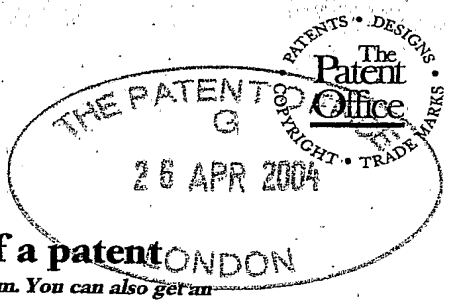

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27APR04 E891662-1 D02000
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3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Helmet Integrated Systems Limited
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08569824001
Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation — United Kingdom

4. Title of the invention — Headgear

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

MATHYS & SQUIRE
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United Kingdom

Patents ADP number *(if you know it)* — 1081001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*
GB	0400572.4	12 January 2004
GB	0400871.0	15 January 2004

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Description	25
Claim(s)	11
Abstract	1
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HEADGEAR

The present invention relates to headgear. In particular, the invention relates to a personalised internal cap for a helmet, a helmet comprising a personalised internal cap, a method of manufacturing such a helmet and protective apparel comprising such a helmet, wherein the internal cap is personalised such that the helmet sits in a predetermined position on a wearer's head.

The invention is particularly suitable for the fitting of helmets for pilots of military aircraft. Such helmets typically comprise an outer protective helmet and, attached to the outer helmet, a helmet mounted display system. Such systems require exact and repeatable placement of images in front of the wearer's eyes during flight. A poorly-fitting helmet tends to move relative to the head during use, thus causing the display to be displaced out of the line of sight of the wearer. A poorly-fitting helmet also causes the weight of the helmet to be focussed on pressure points, resulting in user discomfort.

However, in certain applications, it is necessary for the wearer to wear additional clothing to protect him from the environment in which he is to work. In particular, a protective hood might be worn under the helmet. This may result in the helmet not sitting in the necessary position (for example since the hood wrinkles) for acceptable operation of the external equipment. In addition, this may cause discomfort to the wearer. Tailoring hoods to prevent this may not be cost-effective. In addition, the material from which the hood is made may not be conducive to an accurate and repeatable fit of the helmet to the head of the wearer, for example since it slips against the hair of the wearer.

An aspect of the invention, whose aim is to overcome or alleviate one or more of these problems, provides a personalised cap for a helmet, the cap having an internal form which is bespoke to a specific wearer so as precisely to fit the cap to the wearer's head and an outer form adapted to fit in a generic environmental protection hood such that the hood sits smoothly over the outer surface of the cap.

The provision of a tailored cap in this way allows the general use of hoods and helmets provided in a limited number of sizes. In addition, the hood may be formed of a material best-suited to the protective purpose which the hood is intended to perform, while the cap is formed of a material which will not slide against the hair of the wearer.

A further aspect of the invention provides an environmental protection hood for use under a protective helmet, comprising an aperture containing a window adjacent the periphery of which is provided means for engaging with a personalised cap as set forth above.

Such a hood may serve to locate accurately the window relative to the head of a wearer.

The hood preferably also comprises further means, adjacent the periphery of the aperture, for engaging with an opening in a helmet. Such a hood may further serve to locate accurately a helmet relative to the head of the wearer.

A further aspect provides an environmental protection hood comprising a manifold having means external to the hood for receiving supply of services needed within the hood, and means internal to the hood for providing those services where required.

The provision of a manifold in this way may eliminate the necessity for a plurality of openings in the hood and thereby reduce the likelihood of failure due to leakage around such an opening.

A further aspect of the invention provides a respiratory mask air supply hose comprising enclosure means for providing a conduit through which air or oxygen may pass and structural means for maintaining the cross-section of the conduit, the enclosure means being formed of different material from that of the enclosure means.

The enclosure means is preferably formed of a material impervious to an environmental hazard. Such a hose may be lighter than known hoses while being impervious to environmental hazards and thus requiring no additional environmental protection.

The enclosure means is preferably located within the structural means. In this way, the enclosure means may be protected from abrasion. In this case, the structural means is preferably bonded to the enclosure means. This may result in improved structural integrity.

The enclosure means may alternatively be formed of an elongate sheet of the material wound around the structural means in an overlapping helical arrangement. Such a hose may benefit from greater ease of construction.

A further aspect of the invention provides an air supply system for supplying air to an oxygen mask, comprising a junction having a pressure switch adapted to supply air to a mask from a pressurised source when such is present and, in the absence of a pressurised source, from a secondary source adapted to be positively buoyant in water.

Yet a further aspect provides a device for supplying air to an oxygen mask, comprising an air inlet, an outlet for carrying air towards the mask, and means for making the device positively buoyant in water upon contact with water.

A further aspect provides a buoyancy aid or life vest comprising a device according to the preceding aspect.

Preferred features of these aspects are set out in the dependent claims.

In accordance with a further aspect of the invention, there is provided a personalised cap for a helmet, the cap being bespoke to a specific wearer so as precisely to fit the helmet to the wearer's head, the cap comprising a crown portion and a separate

brow portion, the crown and brow portion being contiguous with each other.

Preferably, the brow portion interlocks with the crown portion, so that relative movement of the portions in use may be minimised.

Preferably, at least one said portion is of impact or energy absorbing material. This may result in increased protection of the head of a wearer.

Preferably, the brow portion is thinner than the crown portion. This may allow for the mounting of helmet-mounted equipment closer to the centre of the wearer's head and for the centre of gravity of the helmet as a whole to be better positioned, so as to reduce the out-of-balance load on the wearer.

Preferably, the brow portion is of a different impact or energy absorbing material to the crown portion.

Yet a further aspect provides a helmet comprising a personalised cap as set out above.

Preferably, a brow portion of the helmet is of a smaller radius than a crown portion to permit the attachment over the helmet brow portion of a helmet-mounted display equipment. This also may result in the location of the equipment close to the eyes of the wearer of the helmet.

Preferably, the brow portion of the cap is removable from the helmet without disturbing the crown portion, whereby one brow portion can be substituted for another.

A further aspect provides a method of manufacturing a helmet comprising a personalised internal cap which positions the helmet on the wearer's head, the method comprising a prior determination of the shape of the wearer's head by a measurement device followed by the production of a kit of parts for assembly into

said personalised cap, the kit comprising a crown portion and alternative brow portions, a first said brow portion conforming to the wearer's head when wearing an environmental protection hood, and a second said brow portion conforming to the wearer's head without said hood. There may also be provided alternative crown portions, a first said crown portion conforming to the wearer's head when wearing an environmental protection hood, and a second said crown portion conforming to the wearer's head without said hood.

Preferably, the measurement device is a non-contact measuring device.

Preferably, during the prior determination the relative positions of the wearer's eyes and the measured portion of his head are determined.

Yet a further aspect provides a kit of parts for precisely fitting a helmet to a wearer's head, the kit comprising a crown portion and first and second brow portions of a personalised internal cap which position the helmet on the wearer's head, the first and second brow portions having respectively been produced to align the helmet on the wearer's head to a predetermined position relative to his eyes when the wearer respectively is wearing and is not wearing an environmental protection hood. The kit may also comprise a second crown portion, the first and second crown portions having respectively been produced to align the helmet on the wearer's head to a predetermined position relative to his eyes when the wearer respectively is wearing and is not wearing an environmental protection hood.

The individual components of the kit of parts may also be provided separately, or in any combination. Thus the invention also provides a crown portion of a personalised cap for a helmet, the crown portion conforming to the shape of a wearer's head. The invention also provides, independently, first and second brow portions of a personalised cap for a helmet, the brow portions conforming to the shape of a particular wearer's head when not wearing and when wearing an environmental protection hood, respectively.

Preferably in such a method or kit of parts, the crown portion engages the first brow portion or the second brow portion to form the personalised internal cap.

A related aspect of the invention provides a helmet comprising a personalised internal cap formed from a kit of parts as set out above, and a further aspect provides protective apparel comprising such a helmet or a helmet as set out above.

Yet a further aspect of the invention provides an environmental protection hood for use under a protective helmet, comprising an aperture containing a window adjacent the periphery of which is provided means for engaging with an opening in a helmet.

In this way, the window may be positively located with respect to the helmet. This may result in the minimising of optical effects due to a wearer looking through both the window and the visor of the helmet.

The window is preferably reversibly removable from the hood. This may allow for increased comfort in the event the hood is donned out of anticipated rather than actual necessity. In which case, the window might be removed until necessity for the hood arises, thereby keeping the wearer cooler.

In an example, engaging means are provided for engaging with and retaining the window, which engaging means are preferably mounted on a rigid frame.

Preferably, the hood further comprises fittings for engaging with a respiratory mask to locate such a mask when used by a wearer of the hood. The provision of fittings on the hood for attaching a mask rather than attaching the mask to the helmet may divorce the location of the mask from that of the helmet, in a hood formed of a flexible material. This enables variations in the facial lengths of different users to be better accommodated. This may provide increased comfort for the wearer, particularly when under exertion.

Preferably, the hood further comprises a removable mask portion. The provision of

a removable mask portion of the hood, for example, around the mouth (and preferably nose) of the wearer, such that when the portion is removed the mouth (and nose) are exposed, may increase the comfort of the wearer of the hood in an analogous way as the provision of a removable window.

Preferably, the mask portion comprises a further rigid frame adapted to seal against the rigid frame. This may allow the removable mask portion to be reattached to the main body of the hood rapidly and securely.

The fittings for attaching a mask are preferably provided on the rigid frame of the mask portion, since this may allow the mask portion and mask to be attached and removed in one operation.

Yet a further aspect of the invention provides an environmental protection hood for use over a helmet and a respiratory mask, the hood being adapted to entirely enclose the helmet and mask.

Such a hood may eliminate the need for decontamination of a helmet and mask or for the discarding of the helmet and mask, which may be necessary when using hoods in which the helmet and mask are exposed. In addition, masks used with such a hood need themselves be protective, and a wearer may use a single mask regardless of whether a hood is to be worn.

The hood comprises an aperture having situated therein a window through which a wearer of the hood may see, a selectively releasable seal being provided adjacent an edge of the window such that an opening may be made in the hood. In this way, the wearer of the hood may easily create an opening in the hood in conditions where the wearing of the hood is not necessary (but may be anticipated), thereby increasing his comfort. This feature is also provided independently.

The hood may preferably be worn with a helmet having a front portion which may be raised and lowered by the wearer and it therefore preferably comprises means

for engaging the window with a raisable front portion of a helmet, such that when the hood and helmet are worn together, the window and the front portion of the helmet may be raised and lowered together. This may further server to increase the comfort of the wearer.

Preferably, the hood further comprises fittings for engaging with a respiratory mask to locate such a mask when used by a wearer of the hood.

Hoods in accordance with the preceding aspects of the invention (whether for use over or under a helmet) preferably further comprise a sleeve adapted to receive a hose for delivering air to a respiratory mask worn by a wearer of the hood. In this way, it is not necessary that the hose itself is protective since it is enclosed by the sleeve. A single hose may therefore be used regardless of whether a hood is to be worn. This feature is also provided independently.

The sleeve is preferably formed of the same material as the hood so that it too forms part of the enclosure of the hood, which thereby also protects the hose.

Preferably, the distal end of the sleeve with respect to the aperture of the hood has means inside the sleeve for engaging with a hose by means of which the hose may be fed with air and means outside the sleeve for engaging with an air supply means of an aircraft, by means of which the hose may be fed with air.

The sleeve preferably further comprises at its distal end means for attaching a further hose for providing demisting air to the hood adjacent the head of a wearer and has a further hose for providing that demisting air which runs within the sleeve from its distal end to a portion of the hood adapted in use to be adjacent the head of a wearer, where it may be directed, for example, onto the inside of the window of the hood.

A further aspect of the invention provides a respiratory mask air supply hose comprising enclosure means forming a conduit through which air may pass and

structural means for maintaining the cross-section of the conduit, the structural means being formed of different material from that of the enclosure means.

In comparison with known hoses which are formed entirely of moulded silicone and which have integral ribs to maintain the structure of the hose, such a hose may be made to be lighter by selection of an appropriate material for the structural means, which may in turn result in greatly reduced load on the head of a wearer, particularly under rapid acceleration.

The structural means is preferably formed of a thermoplastic material.

Preferably, the structural means comprising a left-handed helix and a right handed helix, both helices being coaxial with the conduit. In comparison with known hoses air conduits which have a structural means formed of a single helix, such a structural means may have greater structural stability. This feature is also provided separately.

Preferably, the helices are arranged such that, when the hose is compressed or extended, substantially zero torque around the axis of the hose results In this way, if the user of the hose moves towards or away from an air source to which the hose is attached, the likelihood of accidental detachment of the hose by rotation of the attached end under a resultant torque and the risk of a kink forming in the hose may be reduced.

Preferably, the structural means comprises a plurality of left-handed helices and/or a plurality of right-handed helices. This may allow mechanical characteristics of the hose (e.g. stiffness) to be tailored to particular applications.

A further aspect provides a respirator mask comprising a first portion (which is preferably injection moulded) housing at least one valve and a second portion (for example, formed of silicone rubber) adapted to seal around the nose and mouth of a wearer, the first and second portions being formed of different materials.

Known respirator masks, which are largely formed of a flexible material such as silicone rubber in order to provide sufficient flexibility for the mask to seal around the nose and mouth of a wearer. The rigidity necessary for the portion of the mask housing the inspiratory and expiratory valves and the communications components is achieved by means of larger wall sections. In comparison with such known masks, a mask according to this aspect may be lighter since the necessary rigidity may be achieved by thinner wall sections of a less dense material (e.g. a thermoplastics material such as nylon, PA or POM). In addition, the centre of gravity of the mask may be moved towards the seal of the mask. Both the reduced weight and the movement of the centre of gravity are of particular importance where the wearer of the mask is to be subjected to increased accelerational forces, where they may result in a reduced load on the neck of the wearer. This may result in the mask being usable in conditions where the wearer is subjected to yet greater accelerational forces. Furthermore, the tension necessary to securely locate the mask in place may be reduced, resulting in greater comfort for the wearer.

Preferably, the first portion of the mask has at least one integrally-formed portion of a valve. This feature is also provided independently. In known masks, the valves are self-contained units made, tested and sold separately and inserted into the mask. The mask is therefore relatively large since it accommodates both the wall thickness necessary to give the structural portion of the mask rigidity and the wall thickness of the valves. The provision of a portion of the valve (for example, a valve seat or a chamber of an inspiratory or expiratory valve) integrally with the portion of the mask may reduce the overall wall thickness of the mask, perhaps resulting in a yet lighter, more compact mask having the advantages set out above. In addition, the reduced number of interfaces between components of the mask may reduce the likelihood of leaks forming around valves.

A final aspect of the invention provides a fitting for attaching a respirator mask to a helmet, the fitting comprising means for engaging with a helmet, and means for receiving webbing for attaching the fitting to the mask, the webbing receiving means being adapted to be movable such that the direction at which webbing in the

receiving means extends from the fitting relative to the position of the helmet engaging means may be adjusted. In this way, the attitude of a mask attached to the fitting may be adjusted independently of the attitude of the fitting relative to the helmet, which may result in increased comfort for a wearer.

Preferably, the fitting comprises a plurality of independently-moveable webbing receiving means. This may result in greater security in the attitude of the mask relative to the fitting.

The webbing receiving means preferably comprises a disc rotatably-mounted in the fitting, the disk comprising a slot for receiving webbing and/or an arcuate insert slidably mounted in an arcuate slot in the fitting, the insert comprising a further slot for receiving webbing.

Specific embodiments will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows an impact-resistant and energy absorbing helmet in use;

Figure 2 is a part section through the helmet shown in Figure 1 with mask, visor and helmet-mounted equipment removed and showing a personalised cap;

Figure 3 shows a first hood adapted to be worn under the helmet shown in Figures 1 and 2;

Figure 4 shows a second hood adapted to be worn under the helmet shown in Figures 1 and 2, illustrating the removable goggle and mask portion of the hood;

Figure 5 shows a variant of the hood shown in Figure 4;

Figure 6 shows a mechanism by which a mask may be fitted in a mouth and nose portion of the hoods shown in Figures 4 and 5;

Figure 7 shows a further hood adapted to be worn over a helmet;

Figure 8 illustrates a helmet having a raisable visor, showing the visor in its raised position in dotted lines;

Figure 9 shows the hood of Figure 7 with the seal released and the visor of the helmet raised;

Figure 10 shows a further example in which the hood is worn between the helmet and a custom-fitted inner cap.

Figure 11 illustrates a hood having a sleeve for hoses for providing air to a respirator mask and demisting air;

Figure 12 is a schematic representation of a connection assembly at the distal end of the sleeve for connecting hoses running through the sleeve to an air supply of an aircraft;

Figure 13 is a part section through a first hose;

Figure 14 is shows the structural helices of a second hose;

Figures 15 show a sleeve forming the enclosure of a hose having an external seam (Figure 15A) and an internal seam (Figure 15B);

Figure 16 shows a mask suitable for use with the hoods and hoses shown in the previous Figures;

Figure 17 is a simplified schematic representation of a valve forming part of the mask shown in Figure 16;

Figure 18 shows a first embodiment of a fitting for attaching a mask to a helmet or an under-helmet hood;

Figure 19 shows a second embodiment of a fitting;

Figure 20A illustrates the use of an air supply system having a secondary air source above water level; and

Figure 20B shows a buoyant secondary air source.

A first example of a system allowing a wearer of a helmet also to wear an environmental protection hood will first be described, in which the hood is to be worn under the helmet. A second example in which the hood is worn over the helmet will then be described, followed by a third example in which the hood is disposed between a custom-fitted inner liner and the outer shell of the helmet. Finally, further features which may be provided in connection with one or more of the examples will be described.

Figure 1 shows an impact-resistant and energy-absorbing helmet 2. A respiratory mask 4 is provided to allow the user to breathe in conditions where this would otherwise be difficult or impossible, and a visor 6 depending from a helmet-mounted display unit or boss 7 is provided to shield the wearer's eyes.

Figure 2 is a schematic section through the helmet 2 with the mask 4, boss 7 and visor 6 removed,. The helmet comprises an outer shell 8 covering a personalised cap 10 comprising a crown portion 12 (to cover the crown of the head of a wearer of the helmet) and a brow portion 14 (to cover the brow). The crown and brow portions 12, 14 of the cap 10 are contiguous with one another. The outer surfaces of the cap 10 are profiled to conform to the profile of the inner surface of the outer shell 8, such that relative movement of the cap 10 and the outer shell 8, when in use, is minimised.

The crown and brow portions 12, 14 of the cap 10 are formed in accordance with data relating to the size and shape of the head of an intended user of the helmet obtained by gauging the profile of the wearer's head, for example by a measurement

device operating by direct measurement or by a non-contact method such as optical scanning, without an environmental protection hood so that when the wearer for whom the helmet 2 was constructed wears the helmet without such a hood, it fits closely to his head, and the possibility of movement of the helmet relative to the head is minimized.

In addition, an alternative brow portion 14' (shown in dotted lines) of the cap 10 is provided. The outer surface of this alternative brow portion is also profiled to conform to the profile of the inner surface of the outer shell 8. However, the inner surface of the alternative brow portion 14' is formed in accordance with data relating to the size and shape of the head of the intended user of the helmet while wearing an environmental protection hood so that when the wearer wears the helmet with such a hood, the helmet fits closely to his head and, again, the possibility of movement of the helmet relative to the head is minimized. In some embodiments it may be necessary also to change the crown portion to accommodate the environmental protection hood; then the alternative crown portion 12' (again shown dotted) is formed based on data defining the size and shape of the user's head when wearing the hood. In the preferred embodiment, the alternative brow portion 14' is shaped to accommodate a frame of the environmental protection hood (described in more detail below).

At the interface between the crown and brow portions 12, 14 of the cap 10, the portions engage with one another or interlock to inhibit relative movement of the portions during use of the helmet. However, the portions may be removed from the outer shell 8 independently of one another; in particular, the brow portions 14, 14' of the cap may be interchanged without disturbing the crown portion.

Both portions of the cap 10 are formed of an energy or impact absorbing material (for example, expanded polystyrene) in order to protect the wearer from injury in the event of an impact. Furthermore, the crown portion 12 of the cap is thicker than the brow portion 14, 14' and, in a particular embodiment, the portions are formed of different energy or impact absorbing materials having different impact properties.

The outer shell 8 of the helmet also comprises crown and brow portions 16, 18 respectively, which correspond approximately to the crown and brow portions of the cap 10. The outer radius of the shell brow portion 18 is less than that of the shell crown portion to permit the attachment over the brow portion of a helmet mounted display equipment. In conjunction with a thinner brow portion 14, 14' of the cap 10, this allows the display equipment to be mounted close to the eyes of the wearer of the helmet.

In the preferred embodiment, the measurement device by means of which data relating to the size and head of the intended wearer of the helmet is a non-contact device (for example which scans the head of the wearer of the helmet optically). In order to ensure accurate fitting of the helmet 2 and control over the attitude at which it sits upon the head of the wearer, the positions of the eyes of the wearer relative to one another and to the measured portion of his head are determined.

An environmental protection hood for use in conjunction with a helmet having the above-described personalised cap will now be described.

Figure 3 shows an environmental protection hood 40 to be worn under a helmet. The hood is formed of a flexible material and is adapted to be closing-fitting to the head of a wearer.

An aperture 42 in the flexible material is provided in a region of the hood intended to be situated in front of the eyes of the user when the hood is in use. The material of the hood at the periphery of the aperture is attached to a rigid frame 44, by means of which the shape of the aperture is maintained. The aperture is sealed by a removable clear window 46 through which a wearer of the hood may see.

Upper and lower clips 48, 50 are provided on the frame adjacent the brow and the cheeks respectively of a wearer of the hood for engaging with clips in a helmet such that the frame and the window are positively located relative to the helmet. In a preferred embodiment, the lower clips 50 are adapted to engage with mask

receivers in a helmet under which the hood is worn (described in further detail below with reference to Figure 6).

The hood further comprises a mask region 52, intended to be situated adjacent a respiratory mask worn by the wearer of the hood, such that the mask is enclosed with the head of the wearer. At sides of the mask region, that is to say in locations on the inner surface of the hood, adjacent the cheeks or the ears of a wearer of the hood, there are provided receivers for receiving bayonets for locating the mask adjacent the mouth of the wearer. While the receivers may be attached to the frame, in a preferred embodiment the receivers are not attached to the frame and the flexibility of the material between the receivers and the window allows the receivers to move relative to the window.

In a further embodiment, shown in Figure 4, the mask region of the hood is removable. In this embodiment, the frame 44 (the main frame) additionally defines an aperture 54 in the region of the mouth and nose of the wearer. The mask region of the hood comprises a further frame 56 (the mask frame) having a shape corresponding to that of the main frame such that the mask frame seals against the main frame. Clips 57 are provided on the mask frame 56 which engage with clips 47 on the main frame 44 to positively locate and seal the mask frame against the main frame. In this embodiment, the lower clips 50 are provided on the mask frame 56.

In a variant of this embodiment (shown in Figure 5), the aperture 54 in the region of the mouth and nose of the wearer is not formed by the main frame 44 but by a secondary frame 45.

Turning to Figure 6, a mechanism for locating the mask within the hood shown in Figure 5 will be described. The mask region 52 of the hood comprises bayonets 50 for engaging with a helmet and a mask. The bayonets 50 extend through the mask region of the hood, which is sealed around them, to provide clips on the inside and the outside of the hood. On the outer surface of the mask 52, the bayonets 50

comprise clips 50' which are adapted to engage with the receivers in a helmet to which the bayonets 5 of the mask 4 are ordinarily attached when an under-helmet hood is not worn. The bayonets 5 of the mask 4 (which may be the same mask which is used when a hood is not necessary and which may be custom fit to a wearer) are removed, and the mask instead engages with the interior clips 50" of the hood bayonets 50. The air hose 104 attached to the mask 4 is inserted into the sleeve 102 as described above.

As indicated above, in an alternative embodiment, the interior clips 50" and the exterior clips 50' are not rigidly located relative to one another, in order to allow relative movement of the mask and the helmet.

The second example will now be described.

As indicated above, in this example, the hood is worn over a helmet for example as shown in Figure 1.

Figure 7 shows a hood 80 being worn over a helmet (such as that shown schematically in Figure 8). The hood is formed largely of a flexible material which allows the hood conform to the shape of the helmet over which it is worn. A transparent window or visor 82 is provided in an eye region of the hood, through which the wearer of the hood may see. A releasable seal 84 is provided along or adjacent the lower edge of the visor 82. By releasing this seal, an opening may be made in the hood.

Turning to Figure 8 an example of a helmet with which the hood may be worn comprises a head portion 92 and a helmet-mounted display unit (HDU) mounted on the head portion at pivots 96 so that the HDU may be raised from a first position to a second position (shown in dotted lines). A transparent visor 98 depends from the HDU 94.

When the hood 80 is worn with such a helmet 90, the hood visor 82 and the helmet

visor 98 are both situated in front of the eyes of the wearer. Adjacent the periphery of the hood visor 82 are provided clips which engage with the boss 94 to locate the visors 82, 98 in relation to one another. Thus, when the seal 84 is released, both the hood visor 82 and the helmet visor 98 may be raised together, as shown in Figure 9.

The third example will now be described with reference to Figure 10, which illustrates features of the example schematically.

As indicated above, in this example, the hood 400 (shown in dotted lines) is worn between a custom-fitted inner cap 402 and the shell 404 of a helmet. The custom-fitted inner cap 402 extends across the top of the head of a wearer from a position roughly adjacent the brow to a position above or roughly adjacent the external occipital protuberance. An impact attenuating liner 406 extending roughly from a position roughly adjacent the crown of the head of the wearer to a position above or roughly adjacent the external occipital protuberance of the wearer is fixed inside the shell 404 of the helmet such that a portion of the hood 400 adjacent the top and back of the head of the wearer is disposed between the cap 402 and the liner 406. In order to be able to locate the helmet accurately and repeatable on the head of the wearer, the custom-fitted cap 402 is shaped on its inner surface to fit closely the head of the wearer, and on its outer surface to fit inside the shell 404 and the liner 406 of the helmet with a hood 400 disposes therebetween.

A rigid frame 408 (having features in common with the rigid frame 44 shown in Figure 3) is provided around an aperture in the hood 400, in which is removably located a window 410. The frame 408 comprises on its inner side (with reference to the helmet) a generally upward-opening, 'U'-shaped channel 409 which receives the forward edge of the cap 402, rigidly locating relative to one another the cap 402, the window 410 and the shell 404 of the helmet.

A portion 401 of the hood 400 adjacent the mouth and nose of the wearer is shaped to allow a mask (not shown) to be worn under the hood (as described above). An

oxygen mask manifold 412 is provided in an aperture adjacent this portion 401 of the hood 400. The manifold 412 forms the sole point of entry for services into the interior of the hood. On its external side, it includes fittings to receive an air hose in order to supply air to the mask and, via a hose 420, to a plurality of jets 422 formed in the frame 408 adjacent the channel 409, the jets being arranged to direct air onto the inner surface of the window 410 to reduce or eliminate misting. The manifold also comprises a connection for a drinking tube 414 for providing a liquid to the wearer. Communications leads 416 extend from a microphone (not shown) located in the mask and earphones 418 worn by the wearer down through the manifold 412.

Finally, a helmet mounted display 424 for providing the wearer with information is provided on the forward side of the helmet.

The hood (as described in any of the three preceding examples) may be formed of a breathable (permeable one-way) fabric to increase wearer comfort. It may also be impregnated with a catalyst to promote self-decontamination when the hood has been worn in harmful environments. In order to increase wearer comfort still further, the hood may be formed of a translucent material to reduce or eliminate a claustrophobic reaction by a wearer.

Turning to Figure 11, a system for providing air to a respiratory mask worn together with the hood will now be described. This system is applicable equally to the under-helmet hood 40 and the over-helmet hood 80 described above.

The hood 100 comprises a sleeve 102 formed of the same flexible material as the main body of the hood. A hose 104 for feeding air to a respiratory mask 105 worn by the wearer of the hood is inserted into the sleeve and the proximal end of the hose 104 is connected to the mask in a known manner.

Also running through the sleeve is a further hose 106 for supplying demisting air to the window 101 of the hood 100.

At the distal end of the sleeve is provided a connection assembly 110 (see Figure 12). The connection assembly comprises a socket 112 on the inside of the sleeve in flow communication with a plug 114 on the outside of the sleeve. The socket 112 is adapted to receive and retain the hose 104 for supplying air to the mask 105 (which may, for example, be as currently used to supply air to respiratory masks in aircraft) and the further hose 106 for supplying demisting air. The sleeve is sealed around the connection assembly 110, but air may pass into the hoses from the air supply of an aircraft via the connection assembly. In this way, air may be supplied to the mask 105 by means of a hose which is enclosed in the hood. In the case of a hood intended to be worn over a helmet, cables for power, data and communications also reach the helmet via a sleeve (for example, the sleeve 102 shown in Figures 11 and 12.

A hose suitable for use with the above-described systems will now be described with reference to Figures 13 and 14.

Figure 13 shows a first hose 120 comprising an enclosure means in the form of a silicone rubber wall 122 shown in cross-section, and structural means, for maintaining the structure of the hose, in the form of two coaxial helices, one 124 running inside the other 126. The inner helix 124 is right-handed while the outer helix 126 is left-handed, and their radii are similar such that there is contact between the helices where they cross one another. In some embodiments, the helices may be bonded to one another. Furthermore, the helices may float freely within the outer wall 122, they may be bonded to it along their length (for example, using a thin film adhesive), or they may be constrained relative to the wall at either or both ends. In a particular example, the structural means is formed as a tape which is wound around the helices.

The helices are formed of a thermoplastics material such as nylon, polyethylene or polypropylene by extrusion.

Figure 14 shows an alternative structural means 130 comprising a left-handed outer

helix 132 around three right-handed inner helices 134, 136, 138. The inner helices 134, 136, 138 have smaller cross-sections (i.e. the cross-section of the material forming the helix, rather than of the helix itself) than the outer helix 132. The helices are again of extruded thermoplastics material.

Further embodiments are possible having one or more helix in each direction, the helices being of various cross-sections and pitch and in various arrangements. However, the cross-sections, pitch and arrangement of the helices are chosen so as to minimise the torque around the axis of the hose produced when the hose is compressed or stretched. For example, in the arrangement shown in Figure 11, the helices are of identical cross-section and identical pitch.

In further embodiments intended for use in the presence of contaminants to which silicone is transparent, the enclosure means (122' and 122" in Figures 15) of the hose may be formed from an elongate sheet of a material, e.g. an impermeable fabric, the long edges of which are sealed together, e.g. stitched and bonded or welded, to produce a sleeve 122', 122" which may be used with the seam 123 external (see Figure 15A) or inverted such that the seam 123 is internal (Figure 15B). The sleeve may then be fitted (or indeed it may be formed) around the outside of the structural means (e.g. helices as described above) or it may be inserted within the structural means, at least portions of which are then bonded to the sleeve such that they maintain the lumen of the sleeve.

In yet further embodiments (not shown), the enclosure means may be formed of an elongate material (e.g. an impermeable fabric) which is wound around the structural means in an overlapping helical configuration and bonded in the overlapping regions to provide an impermeable enclosure.

A mask will now be described which may be used in conjunction with the above-described systems.

With reference to Figure 16, the mask comprises a rigid unit 240 which houses all

of the common elements of the respirator, such as an inspiratory valve unit, an expiratory valve and a communications microphone. The unit 240 is connected to a supply hose 242 for the supply of breathing gas to a wearer, such as an airman. The unit 240 is formed by injection moulding of a thermoplastics material such as nylon, and is moulded to have interior surfaces of the mask which serve as valve seats for the inspiratory valve and expiratory valves, and cavities or depressions which serve as pressure chambers for the valves.

Figure 17 is a simplified schematic representation showing a valve 210 in the wall of the unit 240. The valve comprises a cavity 262 defined in the wall of the unit 240, which serves as a chamber of the valve. The chamber is closed by a cover 264 which screws into the opening in the chamber 262. The cover comprises openings 266 to allow exhalate into the chamber, and a side wall of the chamber comprises a further opening 268 to allow the exhalate to leave the chamber.

Opposing depressions in the cover 270 and the wall of the unit 240 serve to locate a shaft 272 upon which is mounted a valve disc 274. The disc 274 is slidable along the shaft 272 and is urged by a spring 276 towards the cover 264 where it seals the openings 266, preventing air from outside the mask entering the mask via the chamber 262.

While the valve shown is simplified in order to provide a clear example, the principle is equally applicable to inspiratory and expiratory valves, including valves through which air is to be breathed under pressure.

The unit 240 is a common element of the breathing mask, in that it is supplied in common to many airmen regardless of facial size and/or shape. The unit 240 is connected to a pre-formed unit 244 having a flexible body moulded from, for example, rubber material, for sealing to an airman's face. The inner surface of the body may be moulded with features 247 which prevent the reflex edge of the sealing surface of the unit from becoming inverted under pressure.

The pre-formed unit 244 is a sized component, which may also be shaped to suit differing racial characteristics, selected from a range of such units 244 according to the size and/or shape of the wearer's face. The units 240, 244 are assembled by threading the supply hose 242 though aperture 248 in the unit 244 and drawing the unit 244 around the unit 240 so that lip 250 of the unit 244 engages the raised edge 252 of the unit 240. A rigid clamping unit 254, which may be formed from moulded plastics material, is, like the unit 244, a sized component and selected from a range of similar units in accordance with the particular unit 244 chosen for the airman. The clamping unit 254 is assembled to the units 240, 244 by similarly threading the supply hose 242 through the aperture 256 and drawing the clamping unit 254 around unit 240 to engage the unit 244. The clamping unit 254 may be secured by a snap-fit or by any conventional fastening.

Finally, fittings to allow a mask to be located within a helmet or an under-helmet hood are described with reference to Figures 18 and 19.

Figure 18 shows a first embodiment of a fitting which comprises an elongate bayonet assembly 302 adapted to engage with receivers in a helmet, and a steelwork portion 304. The steelwork portion 304 comprises two rotatably mounted discs 306, each having a slot 307 through which may be passed webbing 308 for attaching the fitting to the mask. Figure 18A shows the fitting with the discs oriented such that webbing passing through the discs extends in a direction parallel to the axis of the bayonet assembly. In Figure 18B, the same fitting is shown with the discs rotated slightly so that the webbing extends away from the axis of the bayonet assembly 302.

Figure 17 shows a second embodiment of a fitting 300', similar to that shown in Figure 18 with the exception that, instead of discs, the steelwork portion 304 comprises arcuate inserts 310 slidably mounted in arcuate slots 312 having the same radius of curvature as the inserts 310, such that they may slide between the ends of the slots 312. Each of the inserts 310 contains a further slot 314 through which may be passed webbing 308 for attaching the fitting to the mask. Figure 19A

again shows the webbing extending in a direction parallel to the axis of the bayonet assembly 302. In Figure 19B, the same fitting 300' is shown with the inserts rotated slightly so that the webbing extends away from the axis of the bayonet assembly 302.

Finally, embodiments of a device to enable the wearer (e.g. aircrew) of an oxygen mask of the type with which the above-described items may be used (e.g. close-fitting such that the wearer may breathe only via the mask) to breathe in the event that they find themselves in water 498, for example, after having ejected over the ocean (see Figure 20A).

Air is provided to the mask via a hose 500 a distal end of which is attachable to an aircraft air supply via a plug 502 and socket (not shown) arrangement. The hose 500 feeds a first inlet of a block 504 provided in the hose adjacent the chest of the user of the mask. When in use in an aircraft, air is provided to the hose by the aircraft air supply under pressure, and a pressure switch in the block 504 maintains (by action of the air pressure) flow communication between the plug 502 and the mask when air pressure at the first inlet of the block is greater than a threshold pressure. However, when the air pressure at the first inlet falls below the threshold pressure, the pressure switch is released and is biassed to allow flow communication between the mask and a further hose 506 connected to a second inlet of the block 504. At its distal end, the further hose is connected to a snorkel unit 508 which is fixed to the shoulder region of the wearer's buoyancy device 510 by releasable means, such as a thread having a low tensile strength.

The snorkel unit additionally comprises a flotation bladder 512 (see Figure 20B) which is inflated automatically upon or shortly after contact with water by a CO_2 canister having a soluble spring trigger of a known type (for example as used in air line life vests) in which, upon contact with water, a trigger of a soluble material dissolves releasing a bayonet which is biassed towards the canister. The bayonet punctures the canister, releasing the pressurised CO_2 and inflating the bladder. The bladder is arranged such that when inflating it causes the snorkel unit to be released

(e.g. by snapping the thread holding the unit to the life vest) and to float at the surface.

An inlet 514 of the snorkel unit 508 allows air to enter, while baffles 516 prevent or inhibit the ingress of water, for example in rough seas.

Each feature disclosed in the description, and/or the claims and drawings may be provided independently or in any appropriate combination. In particular, a feature of a subsidiary claim may be incorporated into a claim upon which it is not dependent.

CLAIMS

1. A personalised cap for a helmet, the cap having an internal form which is bespoke to a specific wearer so as precisely to fit the cap to the wearer's head and an outer form adapted to fit in a generic environmental protection hood such that the hood sits smoothly over the outer surface of the cap.

2. Protective headgear comprising a personalised cap according to claim 1 and an environmental protection hood.

3. Protective headgear as claimed in claim 2, further comprising a helmet, the external form of the personalised cap, the hood and the internal form of the helmet being adapted such that, when the cap is worn inside the hood, which in turn is worn inside the helmet, the helmet is repeatably positioned relative to the head of the wearer.

4. An environmental protection hood for use under a protective helmet, comprising an aperture containing a window adjacent the periphery of which is provided means for engaging with a personalised cap according to claim 1.

5. A hood as claimed in claim 4, comprising further means, adjacent the periphery of the aperture, for engaging with an opening in a helmet.

6. An environmental protection hood comprising a manifold having means external to the hood for receiving supply of services needed within the hood, and means internal to the hood for providing those services where required.

7. A hood as claimed in claim 6, wherein the external means comprises means for receiving air or oxygen.

8. A hood as claimed in claim 7, wherein the internal means comprises means for feeding an oxygen mask.

9. A hood as claimed in claim 7 or claim 8, wherein the internal means comprises means for feeding a demisting jet for demisting or inhibiting misting of a window of the hood.

10. A hood as claimed in any of claims 6 or claim 9, wherein the external means comprises means for receiving a liquid.

11. A respiratory mask air supply hose comprising enclosure means for providing a conduit through which air or oxygen may pass and structural means for maintaining the cross-section of the conduit, the enclosure means being formed of different material from that of the structural means.

12. A hose as claimed in claim 11, wherein the enclosure means is formed of a material impervious to an environmental hazard.

13. A hose as claimed in claim 11 or claim 12, wherein the enclosure means is formed by bonding long edges of an elongate sheet of the material.

14. A hose as claimed in any of claims 11 to 13, wherein the enclosure means is located within the structural means.

15. A hose as claimed in claim 14, wherein the structural means is bonded to the enclosure means.

16. A hose as claimed in any of claims 12 to 13, wherein the enclosure means is formed of an elongate sheet of the material wound around the structural means in an overlapping helical arrangement.

17. An air supply system for supplying air to an oxygen mask, comprising a junction having a pressure switch adapted to supply air to a mask from a pressurised source when such is present and, in the absence of a pressurised source, from a secondary source adapted to be positively buoyant in water.

18. A system as claimed in claim 17, wherein the secondary source comprises means, for example a filter, or removing contaminants from air to be supplied.

19. A system as claimed in claim 17 or claim 18, wherein the secondary source comprises a buoyancy device which is triggered by contact with water.

20. A system as claimed in any of claims 17 to 19, wherein the secondary source comprises means, for example baffles, for inhibiting ingress of water.

21. A device for supplying air to an oxygen mask, comprising an air inlet, an outlet for carrying air towards the mask, and means for making the device positively buoyant in water upon contact with water.

22. A buoyancy aid or life vest comprising a device as claimed in claim 21.

23. A buoyancy aid or life vest as claimed in claim 22, wherein the air supply device is releasably attached to the buoyance aid or life vest.

24. A buoyancy aid or life vest as claimed in claim 23, wherein the device is adapted to be released from the buoyancy aid or life vest upon contact with water and/or upon activation of the means for making the device positively buoyant.

25. A personalised cap substantially as hereinbefore described with reference to, and/or as illustrated in, the accompanying drawings.

26. Protective headgear substantially as hereinbefore described with reference to, and/or as illustrated in, the accompanying drawings.

27. An environmental protection hood substantially as hereinbefore described with reference to, and/or as illustrated in, the accompanying drawings.

28. A respiratory mask air supply hose substantially as hereinbefore described

with reference to, and/or as illustrated in, the accompanying drawings.

29. An air supply system substantially as hereinbefore described with reference to, and/or as illustrated in, the accompanying drawings.

30. A device for supplying air to an oxygen mask substantially as hereinbefore described with reference to, and/or as illustrated in, the accompanying drawings.

31. A buoyancy aid or life vest substantially as hereinbefore described with reference to, and/or as illustrated in, the accompanying drawings.

A1. A personalised cap for a helmet, the cap being bespoke to a specific wearer so as precisely to fit the helmet to the wearer's head, the cap comprising a crown portion and a separate brow portion, the crown and brow portion being contiguous with each other.

A2. A cap as claimed in claim A1, wherein the brow portion interlocks with the crown portion.

A3. A cap as claimed in claim A1 or claim A2 wherein at least one said portion is of impact or energy absorbing material.

A4. A cap as claimed in claim A3, wherein the brow portion is thinner than the crown portion.

A5. A cap as claimed in claim A4, wherein the brow portion is of a different impact or energy absorbing material to the crown portion.

A6. A helmet comprising a personalised cap as claimed in any of claims A1 to A5.

A7. A helmet as claimed in claim A6 when dependent from claim 4 or claim 5, wherein a brow portion of the helmet is of a smaller radius than a crown portion to

permit the attachment over the brow portion of a helmet mounted display equipment.

A8. A helmet as claimed in claim A6 or claim A7, wherein the brow portion is removable from the helmet without disturbing the crown portion, whereby one brow portion can be substituted for another.

A9. A method of manufacturing a helmet comprising a personalised internal cap which positions the helmet on the wearer's heard, the method comprising a prior determination of the shape of the wearer's head by a measurement device followed by the production of a kit of parts for assembly into said personalised cap, the kit comprising a crown portion and alternative brow portions, a first said brow portion conforming to the wearer's head when wearing an environmental protection hood, and a second said brow portion conforming to the wearer's head without said hood.

A10. A method as claimed in claim A9, comprising providing also alternative crown portions, a first said crown portion conforming to the wearer's head when wearing an environmental protection hood, and a second said crown portion conforming to the wearer's head without said hood.

A11. A method as claimed in claim A9 or A10, wherein the measurement device is a non-contact measuring device.

A12. A method as claimed in claim A9, A10 or A11, wherein during the prior determination the relative positions of the wearer's eyes and the measured portion of his head are determined.

A13. A kit of parts for precisely fitting a helmet to a wearer's head, comprising a crown portion and first and second brow portions of a personalised internal cap which position the helmet on the wearer's head, the first and second brow portions having respectively been produced to align the helmet on the wearer's head to a predetermined position relative to his eyes when the wearer respectively is wearing and is not wearing an environmental protection hood.

A14. A kit of parts as claimed in claim A13 comprising a second crown portion, the first and second crown portions having respectively been produced to align the helmet on the wearer's head to a predetermined position relative to his eyes when the wearer respectively is wearing and is not wearing an environmental protection hood.

A15. A method or a kit of parts according to any of claims A9 to A14, wherein a said crown portion engages the first brow portion or the second brow portion to form the personalised internal cap.

A16. A method or a kit of parts as claimed in any of claims A1 to A15, wherein the first brow portion is shaped to accommodate a visor of the environmental protection hood.

A17. A helmet comprising a personalised internal cap formed from a kit of parts as claimed in any of claims A13 to A16.

A18. Protective apparel comprising a helmet as claimed in claim A17 or manufactured by a method according to any of claims A9 to A12, A15 or A16, in combination with an environmental protection hood.

A19. A personalised cap, a kit of parts, a helmet and protective apparel substantially as hereinbefore described with reference to the accompanying drawings.

B1. An environmental protection hood for use under a protective helmet, comprising an aperture containing a window adjacent the periphery of which is provided means for engaging with an opening in a helmet.

B2. A hood as claimed in claim B1, wherein the window is reversibly removable from the hood.

B3. A hood as claimed in claim B2, comprising engaging means for engaging with and retaining the window.

B4. A hood as claimed in any of claims B1 to B3, further comprising a rigid frame.

B5. A hood as claimed in any of claims B1 to B4, further comprising fittings for engaging with a respiratory mask to locate such a mask when used by a wearer of the hood.

B6. A hood as claimed in any of claims B1 to B5, further comprising a removable mask portion.

B7. A hood as claimed in claim B6 when dependent upon claim B4, wherein the mask portion comprises a further rigid frame adapted to seal against the rigid frame.

B8. A mask as claimed in claim B6 or B7 when dependent upon claim B5, wherein the fittings are provided on the rigid frame of the mask portion.

C1. An environmental protection hood for use over a helmet and a respiratory mask, the hood being adapted to entirely enclose the helmet and mask.

C2. A hood as claimed in claim C1, comprising an aperture having situated therein a window through which a wearer of the hood may see, a selectively releasable seal being provided adjacent an edge of the window such that an opening may be made in the hood.

C3. An environmental protection hood for use over a helmet, comprising an aperture having situated therein a window through which a wearer of the hood may see, a selectively releasable seal being provided adjacent an edge of the window such that an opening may be made in the hood.

C4. A hood as claimed in claim C2 or C3, further comprising means for engaging

the window with a raisable front portion of a helmet, such that when the hood and helmet are worn together, the window and the front portion of the helmet may be raised and lowered together.

C5. A hood as claimed in any of claims C2 to C4, further comprising fittings for engaging with a respiratory mask to locate such a mask when used by a wearer of the hood.

C6. A hood according to any of claims B1 to B8 or C1 to C5 comprising a sleeve adapted to receive a hose for delivering air to a respiratory mask worn by a wearer of the hood.

C7. An environmental protection for use over a respiratory mask, comprising a sleeve adapted to receive a hose for delivering air to a respiratory mask worn by a wearer of the hood.

C8. A hood according to claim C6 or C7, wherein the sleeve is formed of the same material as the hood.

C9. A hood according to any of claims C6 to C8, wherein the distal end of the sleeve with respect to the aperture of the hood has means inside the sleeve for engaging with a hose by means of which the hose may be fed with air.

C10. A hood according to claim C9, wherein the distal end of the sleeve has means outside the sleeve for engaging with an air supply means of an aircraft, by means of which the hose may be fed with air.

C11. A hood as claimed in any of claims C6 to C10, wherein the sleeve further comprises at its distal end means for attaching a further hose for providing demisting air to the hood adjacent the head of a wearer.

C12. A hood according to claim C11, wherein a further hose for providing

demisting air runs from the distal end of the sleeve to a portion of the hood adapted in use to be adjacent the head of a wearer.

D1. A respiratory mask air supply hose comprising enclosure means forming a conduit through which air may pass and structural means for maintaining the cross-section of the conduit, the structural means being formed of different material from that of the enclosure means.

D2. A hose as claimed in claim D1, wherein the enclosure means is formed of silicone rubber or a fabric material.

D3. A hose as claimed in claim D1 or D2, wherein the structural means is formed of an extruded thermoplastics material.

D4. A hose as claimed in any of claims D1 to D3, wherein the structural means comprising a left-handed helix and a right handed helix, both helices being coaxial with the conduit.

D5. An air supply hose comprising enclosure means forming a conduit through which air may pass and structural means for maintaining the cross-section of the conduit, wherein the structural means comprising a left-handed helix and a right handed helix, both helices being coaxial with the conduit.

D6. A hose as claimed in claim D4 or D5, wherein the helices are arranged such that, when the hose is compressed or extended, substantially zero torque around the axis of the hose results.

D7. A hose as claimed in any of claims D4 to D6, wherein the structural means comprises a plurality of left-handed helices and/or a plurality of right-handed helices.

E1. A respirator mask comprising a first portion housing at least one valve and a second portion adapted to seal around the nose and mouth of a wearer, the first

and second portions being formed of different materials.

E2. A mask as claimed in claim E1, wherein the first portion is formed of a thermoplastics material.

E3. A mask as claimed in claim E1 or E2, wherein the second portion is formed of a resilient material.

E4. A mask as claimed in any of claims E1 to E3, wherein the first portion has at least one integrally-formed portion of a valve.

E5. A mask comprising a housing portion having at least one integrally-formed portion of a valve.

E6. A mask as claimed in claim E4 or E5, wherein the at least one portion of a valve is a chamber of the valve.

E7. A mask as claimed in claim E4 or E5, wherein the at least one portion of a valve is a valve seat.

E8. A mask as claimed in any of claims E4 to E7, wherein the at least one portion of a valve is a portion of an inspiratory valve.

E9. A mask as claimed in any of claims E4 to E7, wherein the at least one portion of a valve is a portion of an expiratory valve.

F1. A fitting for attaching a respirator mask to a helmet comprising means for engaging with a helmet, and means for receiving webbing for attaching the fitting to the mask, the webbing receiving means being adapted to be movable such that the direction at which webbing in the receiving means extends from the fitting relative to the position of the helmet engaging means may be adjusted.

F2. A fitting as claimed in claim F1, comprising a plurality of independently-moveable webbing receiving means.

F3. A fitting as claimed in claim F1 or F2, wherein the webbing receiving means comprises a disc rotatably-mounted in the fitting, the disk comprising a slot for receiving webbing.

F4. A fitting as claimed in any of claims F1 to F3, wherein the webbing receiving means comprises an arcuate insert slidably mounted in an arcuate slot in the fitting, the insert comprising a further slot for receiving webbing.

G1. A hood substantially as hereinbefore described with reference to, and/or as illustrated in, the accompanying drawings.

G2. A hose substantially as hereinbefore described with reference to, and/or as illustrated in, the accompanying drawings.

G3. A mask substantially as hereinbefore described with reference to, and/or as illustrated in, the accompanying drawings.

G4. A fitting substantially as hereinbefore described with reference to, and/or as illustrated in, the accompanying drawings.

ABSTRACT

A personalised cap 10 for use with a protective helmet is disclosed, having crown and brow portions 12, 14. The brow portion 14 is removable independently of the crown portion 10, and an alternative brow portion 14' is provided for use when a environmental protection hood is to be worn under the helmet. An alternative crown portion 12' also may be provided.

A hood for use over a helmet and a hose for use to provide air to a respiratory mask, a mask and fittings for attaching a mask to a helmet are also disclosed.

[Figure 2]

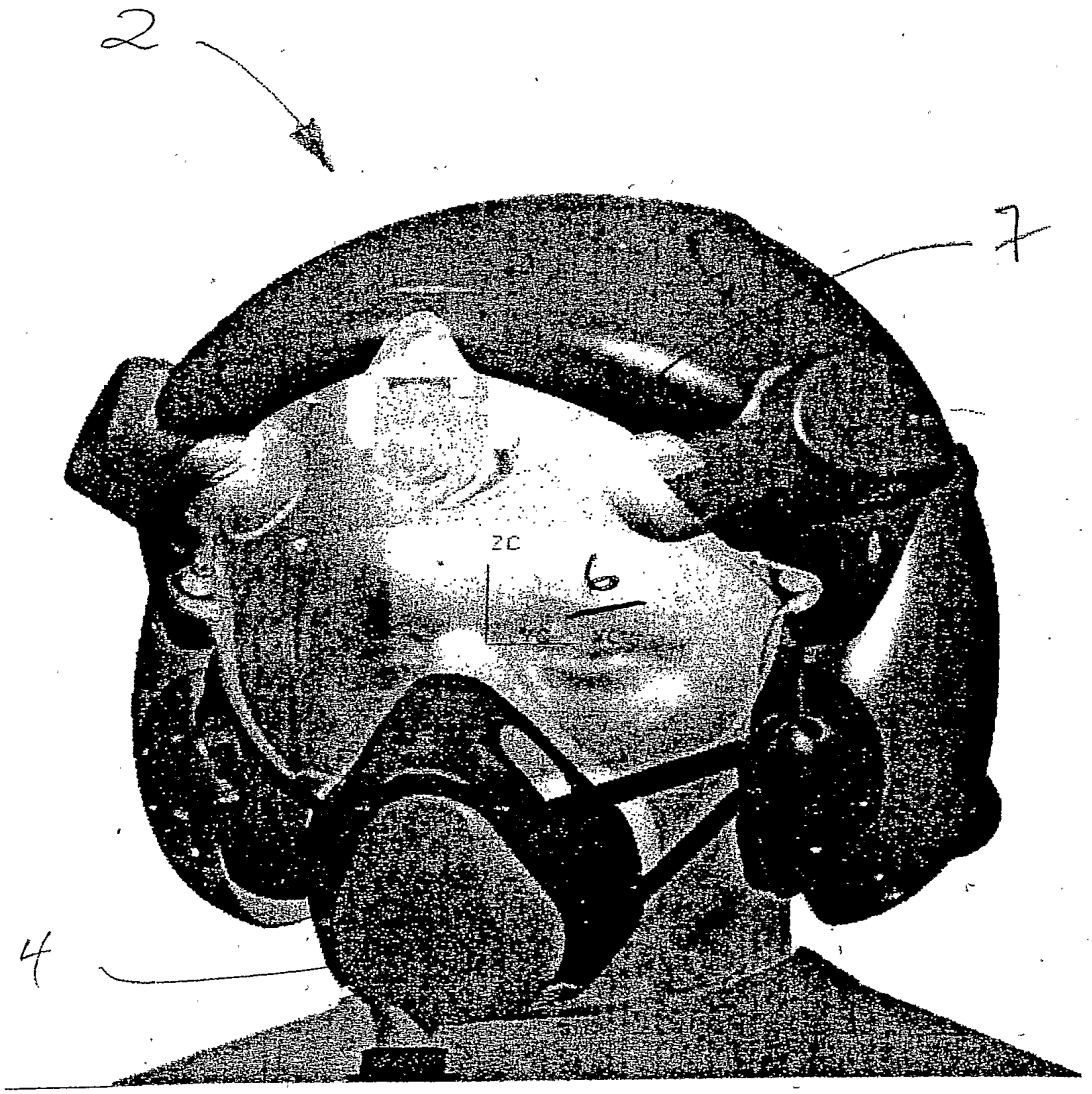


Fig. 1.

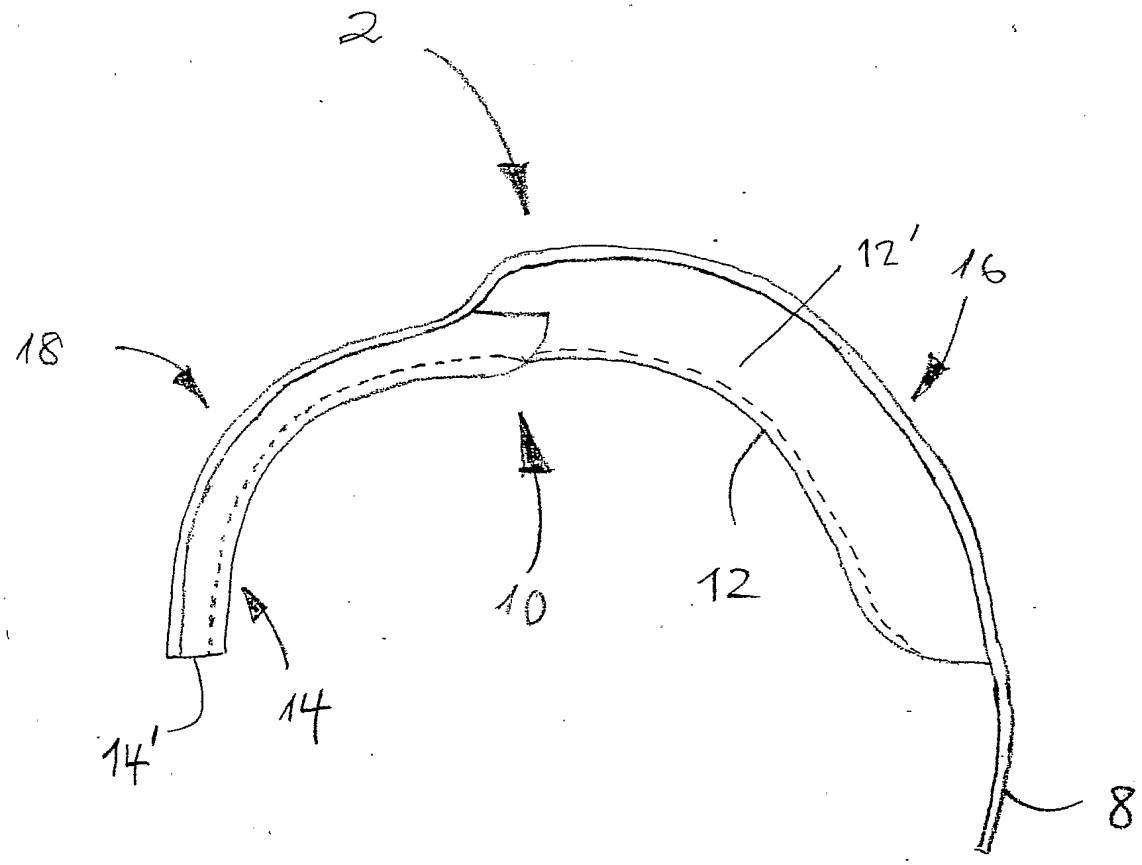


Fig. 2

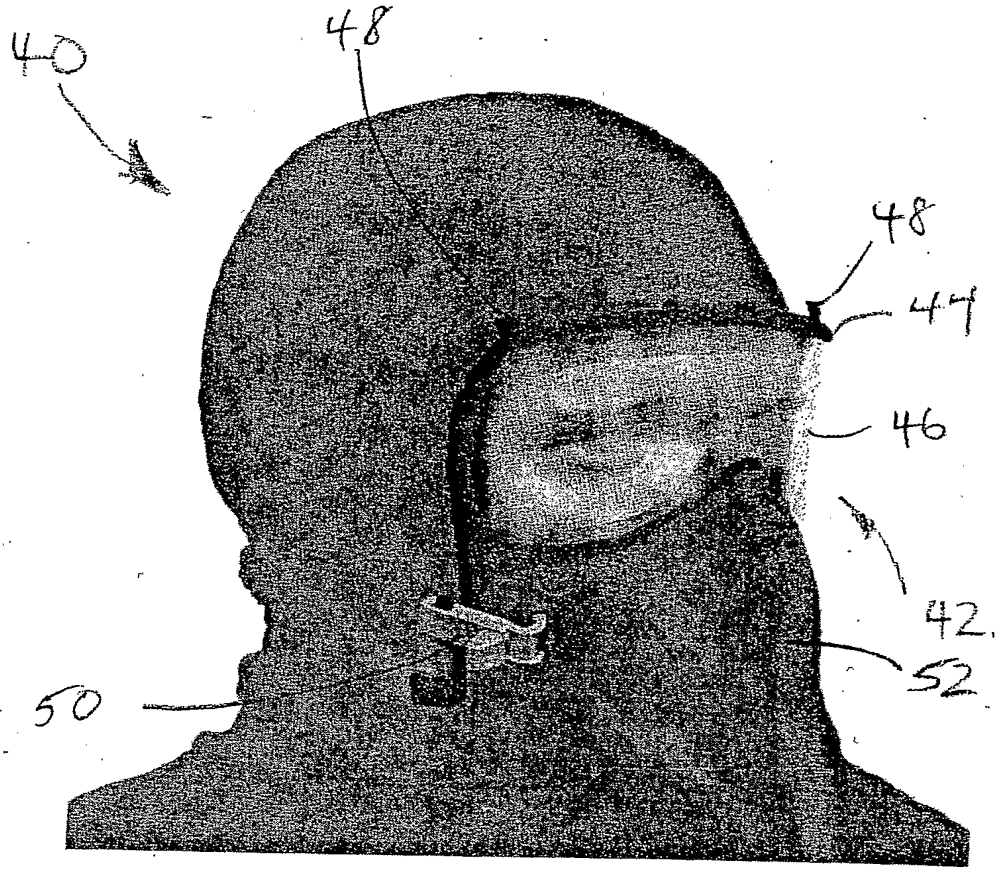


Fig. 3

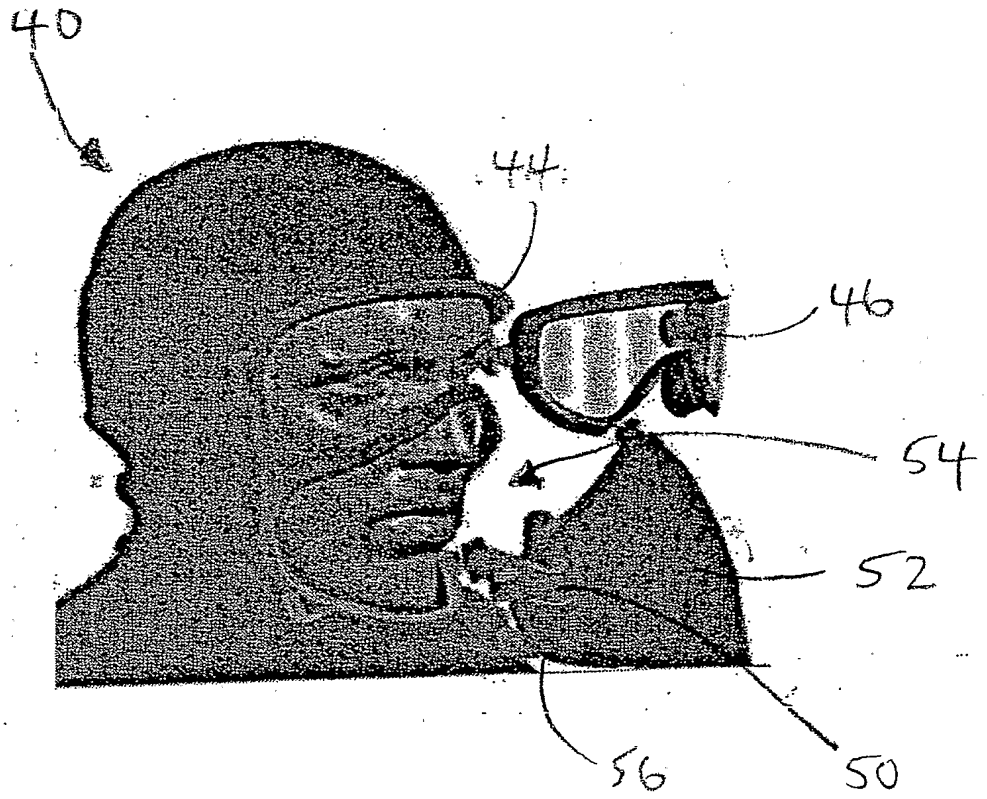


Fig. 4

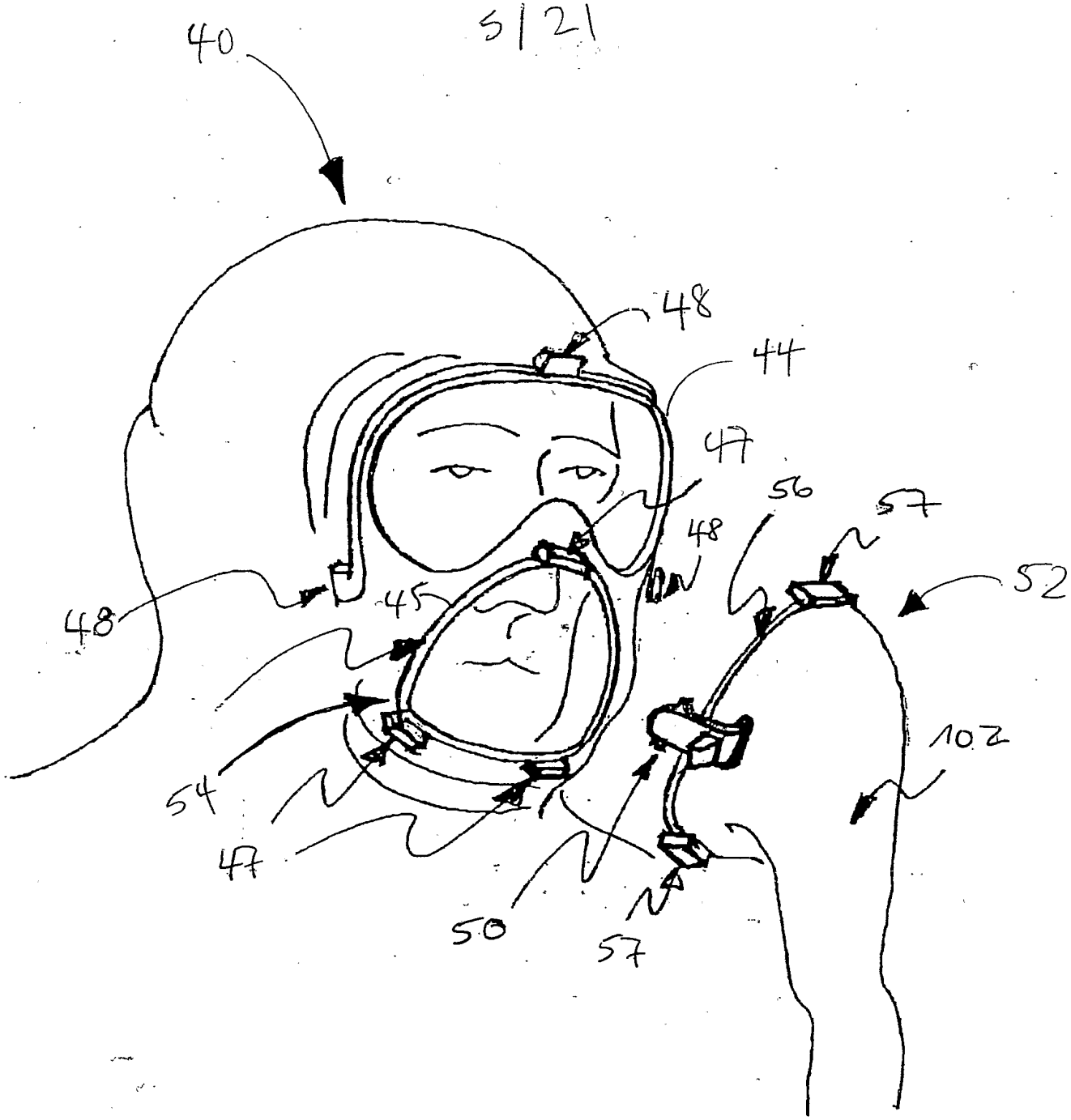


Fig. 5

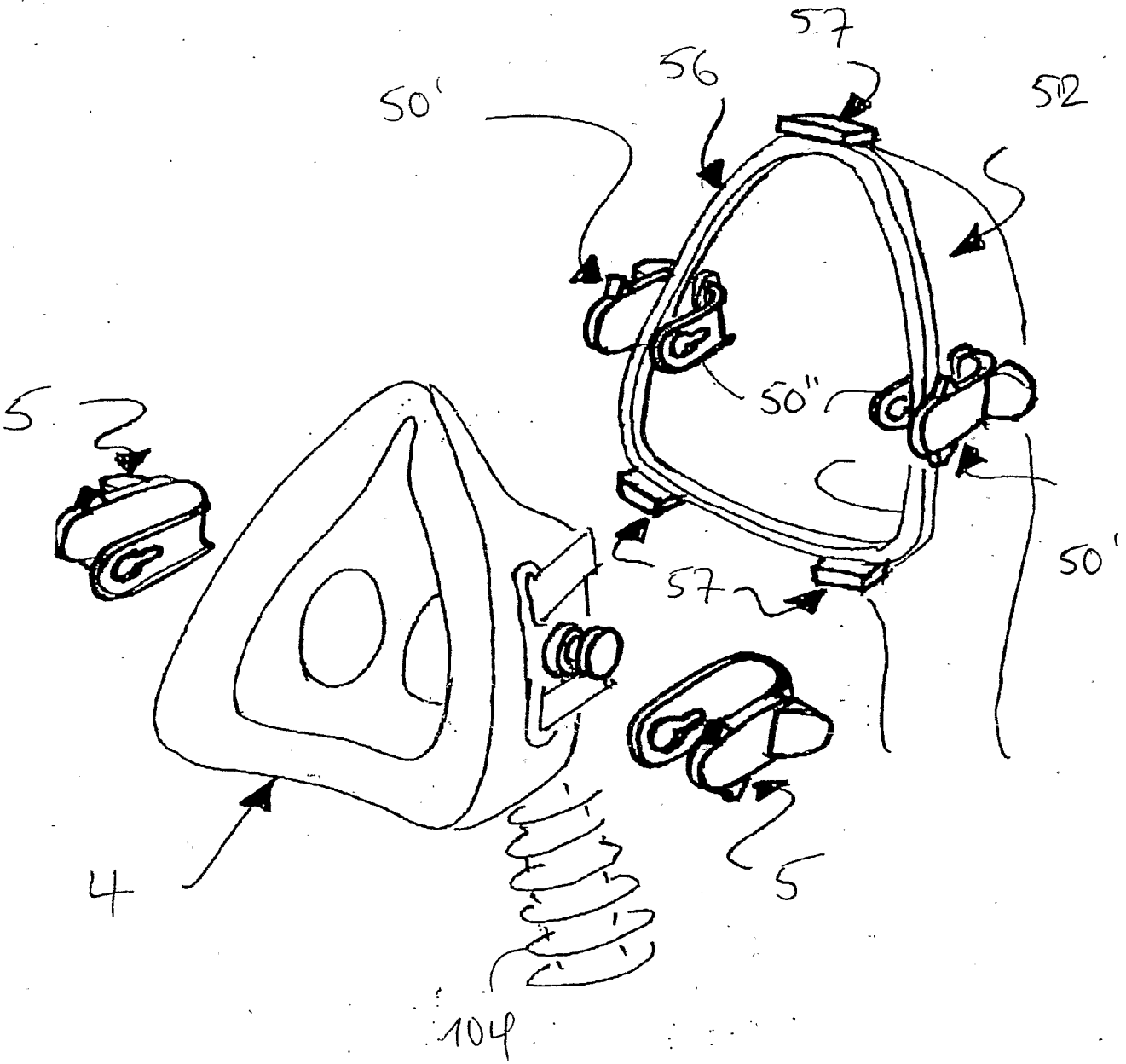


Fig. 6

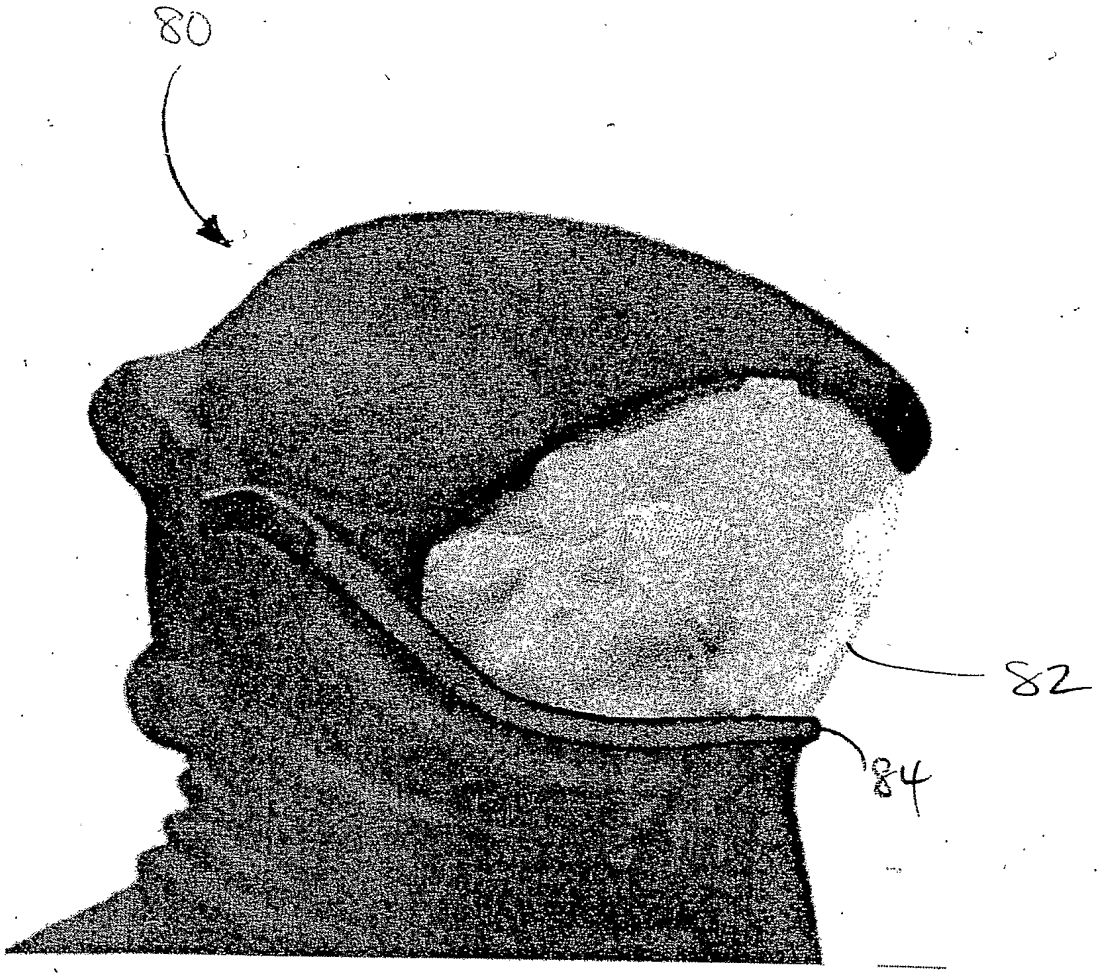


Fig. 7

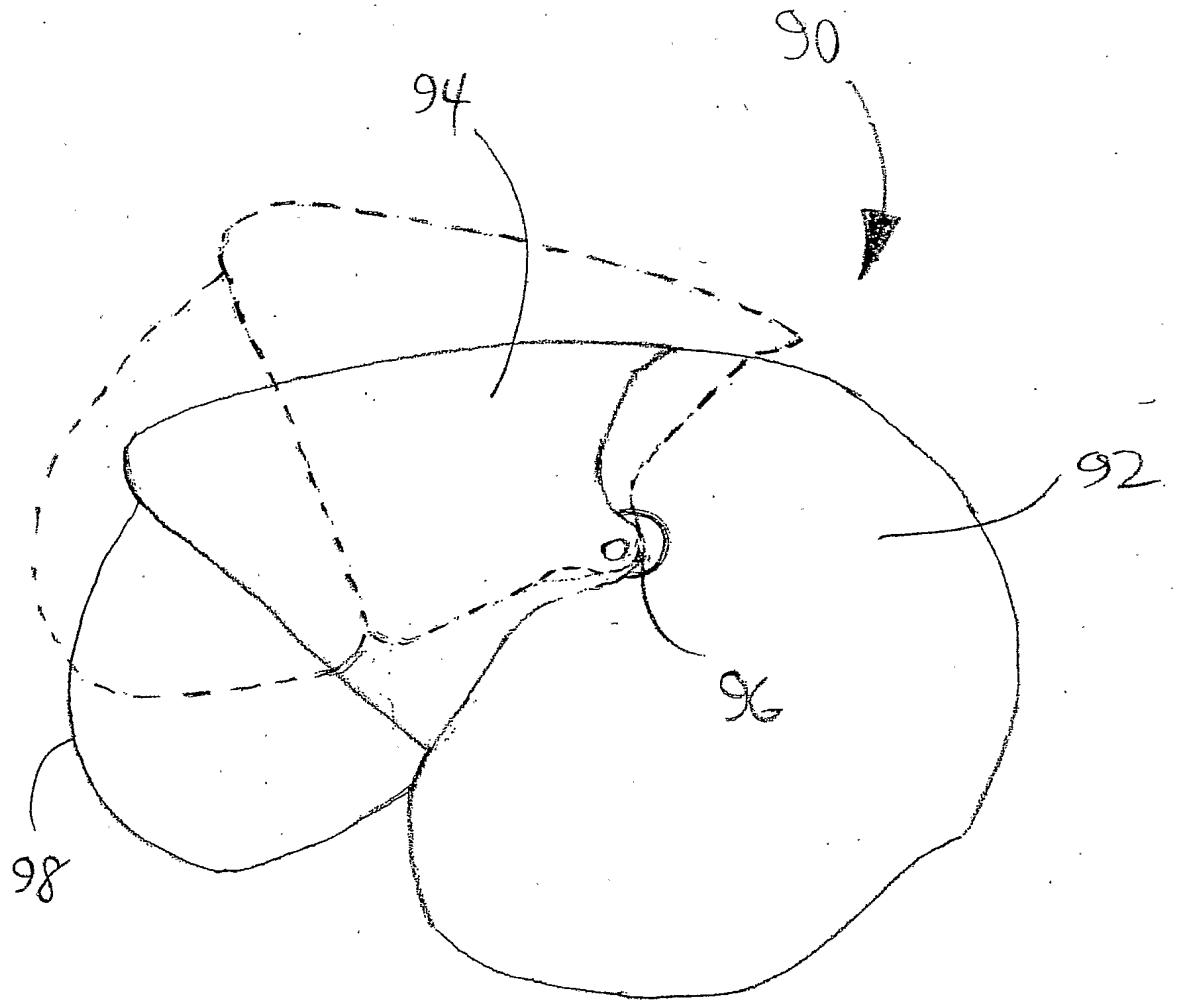


Fig. 8

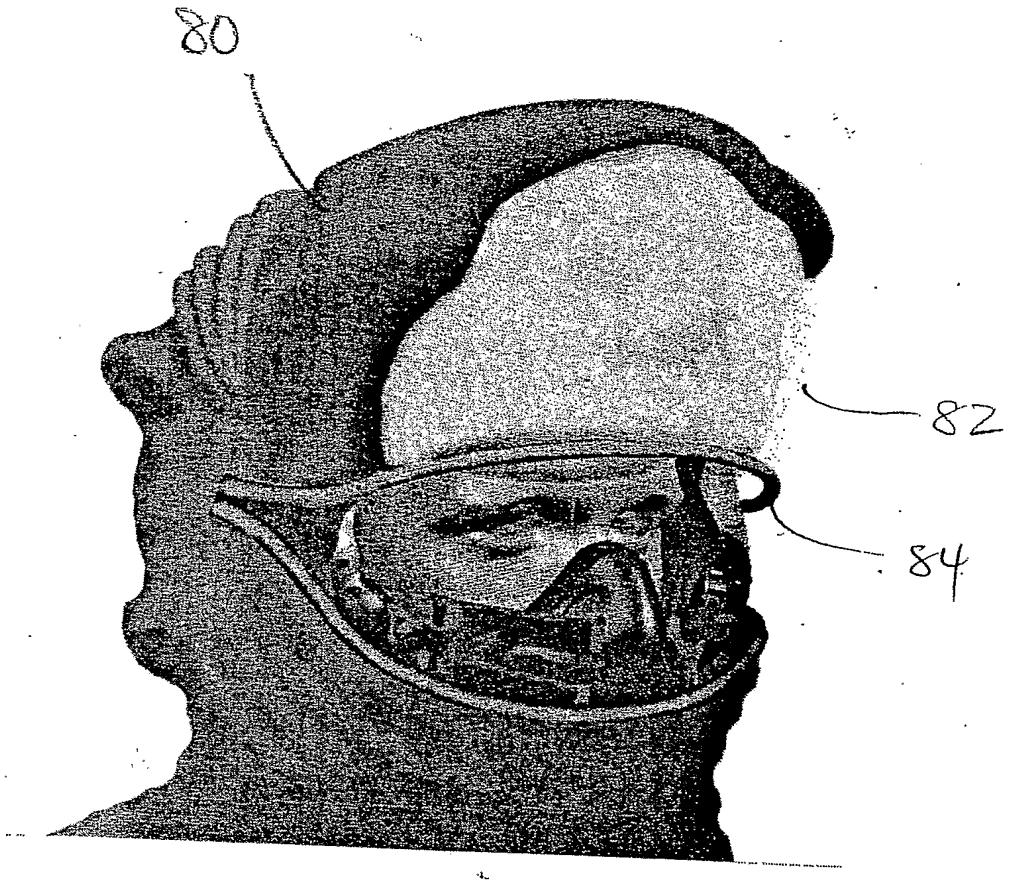


Fig. 9

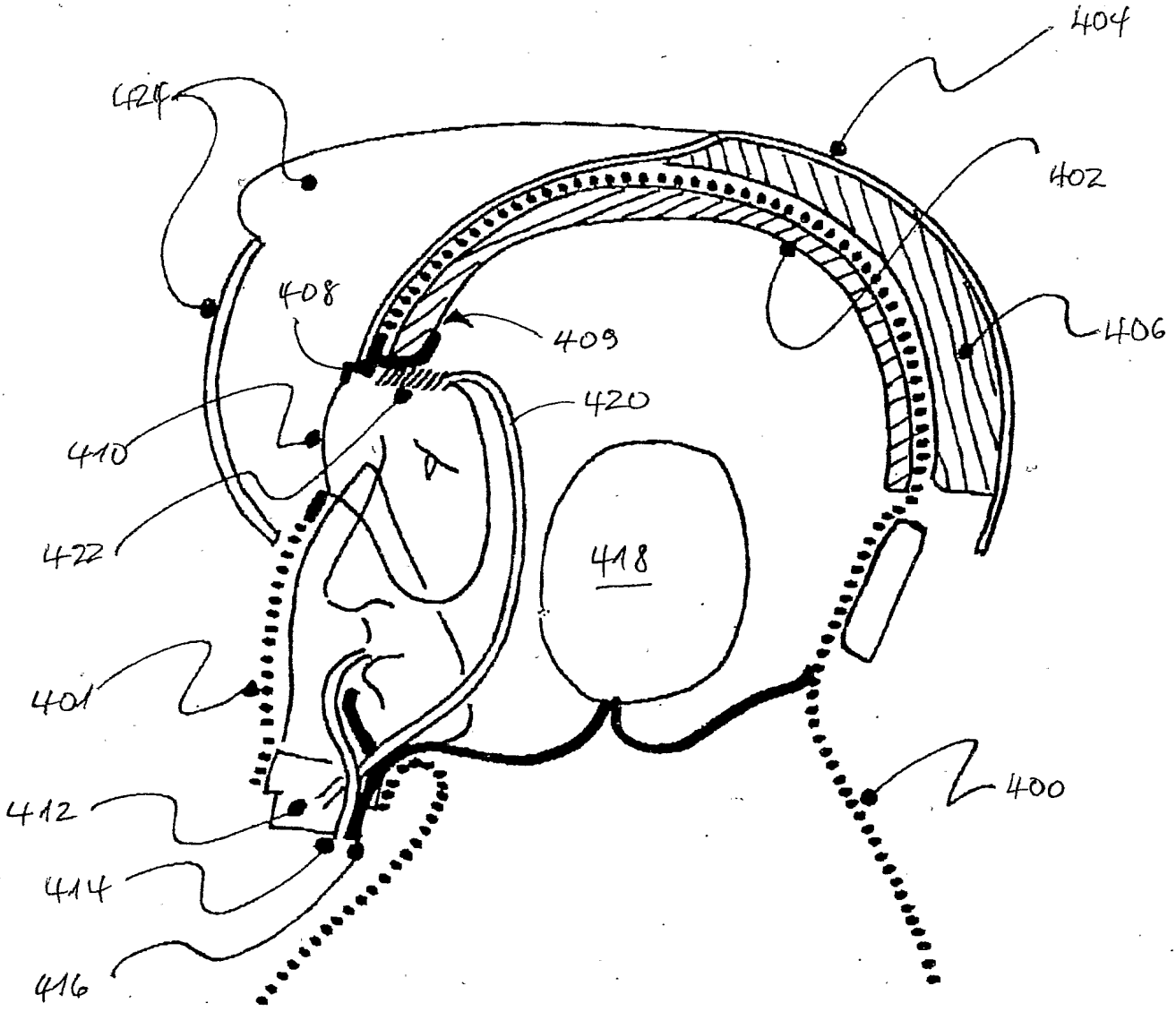


Fig. 10.

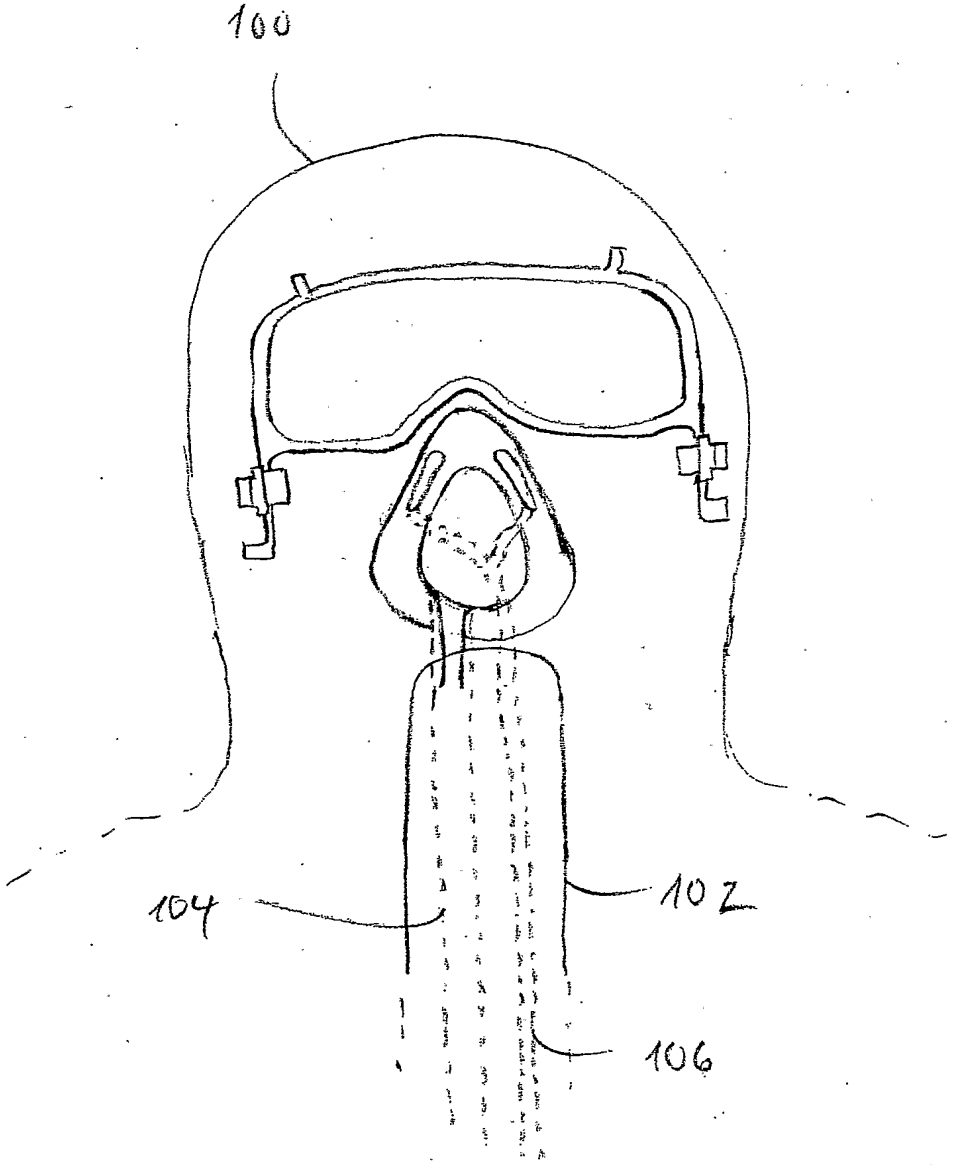


Fig. 11

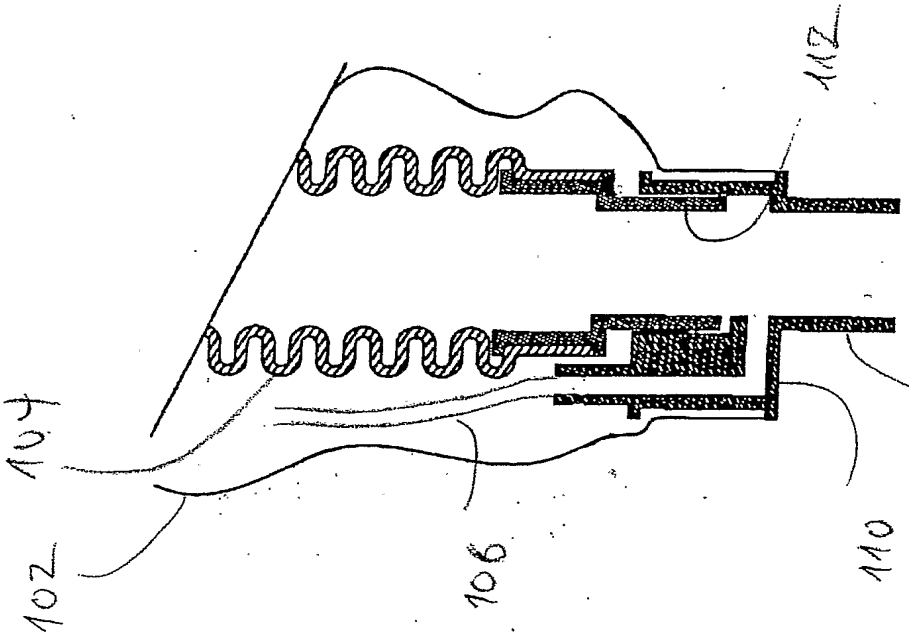


Fig. 12

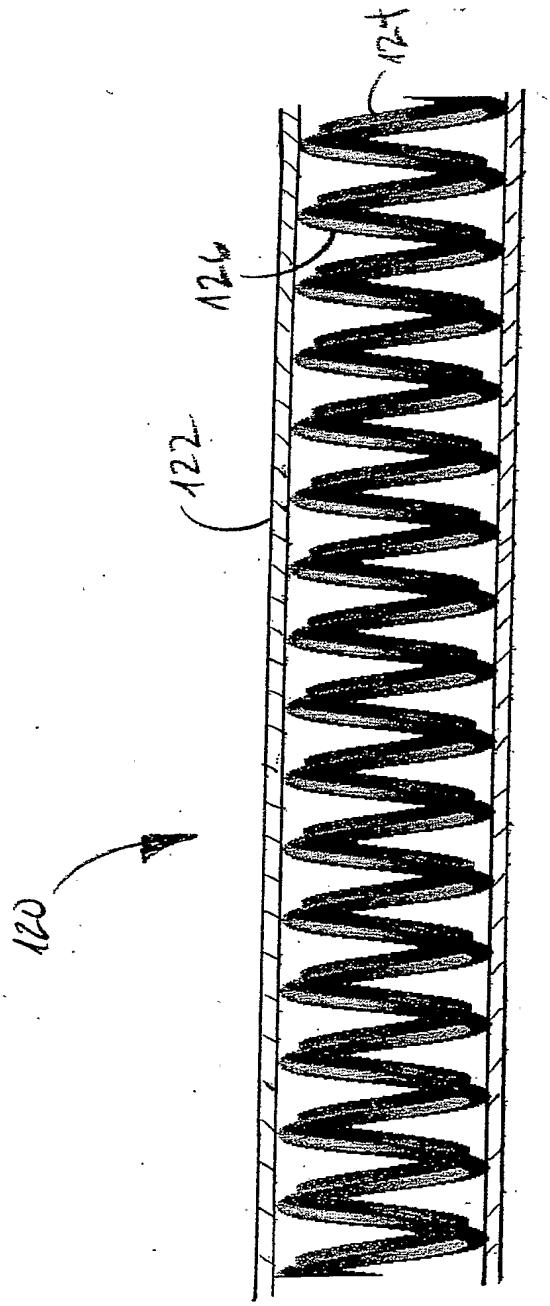


Fig. 13

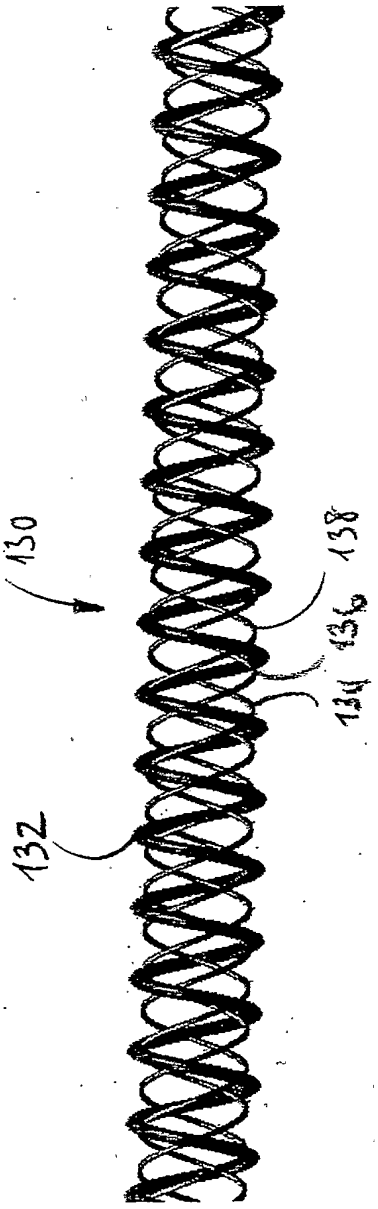
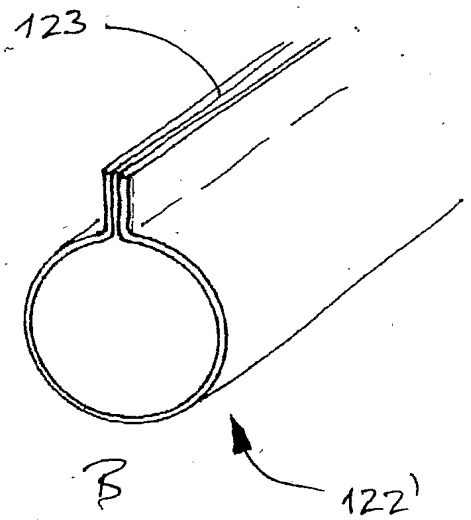


Fig. 14



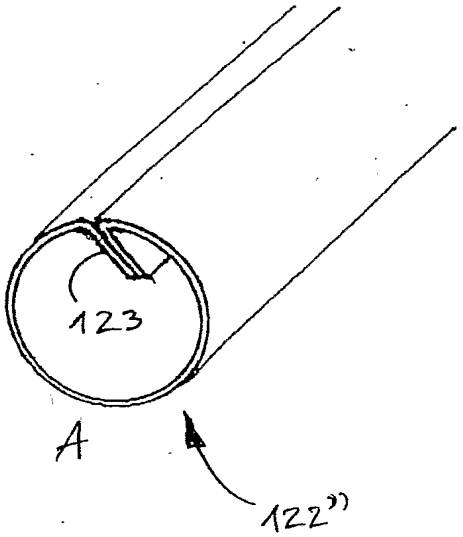


Fig 15

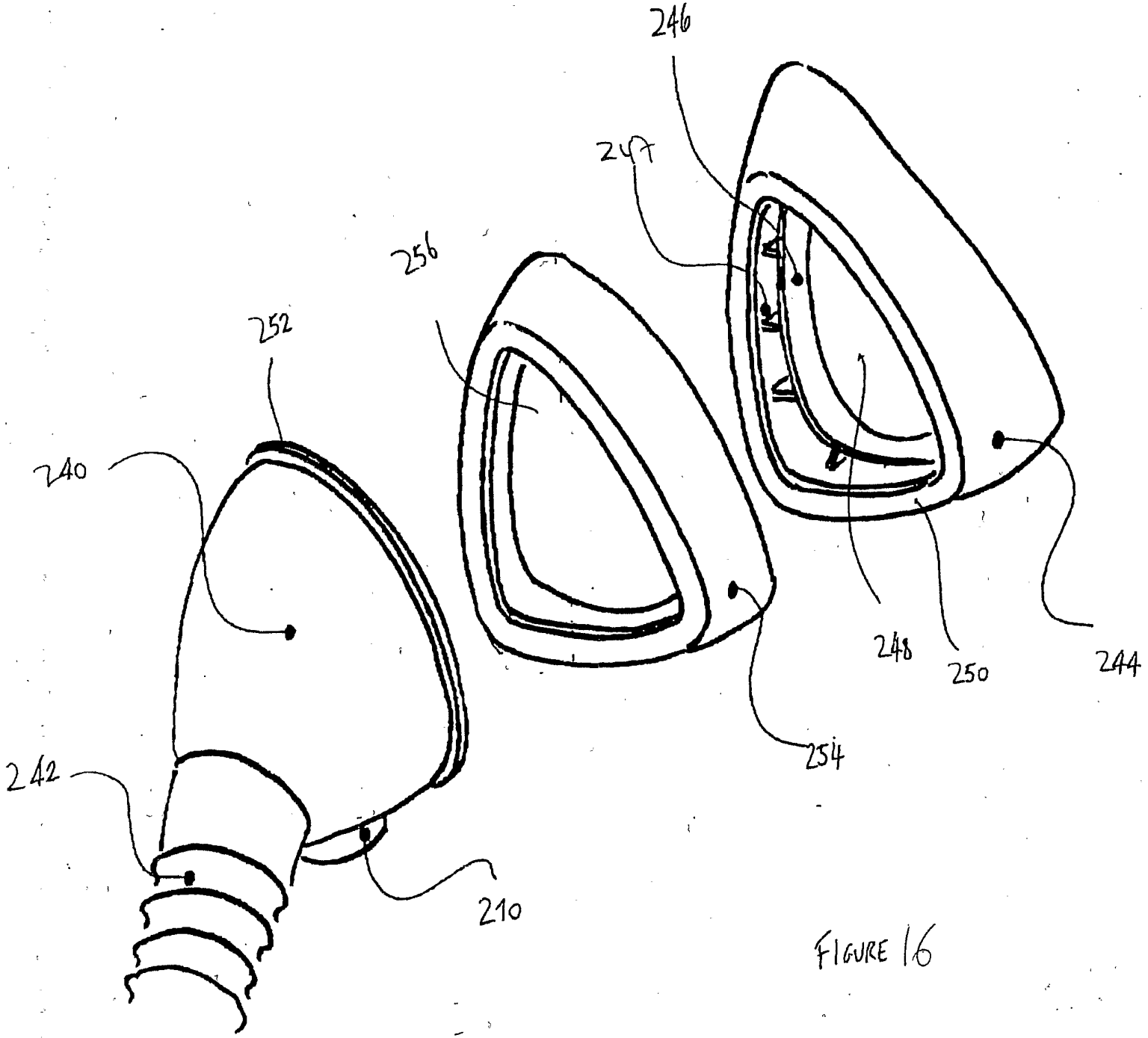


FIGURE 16

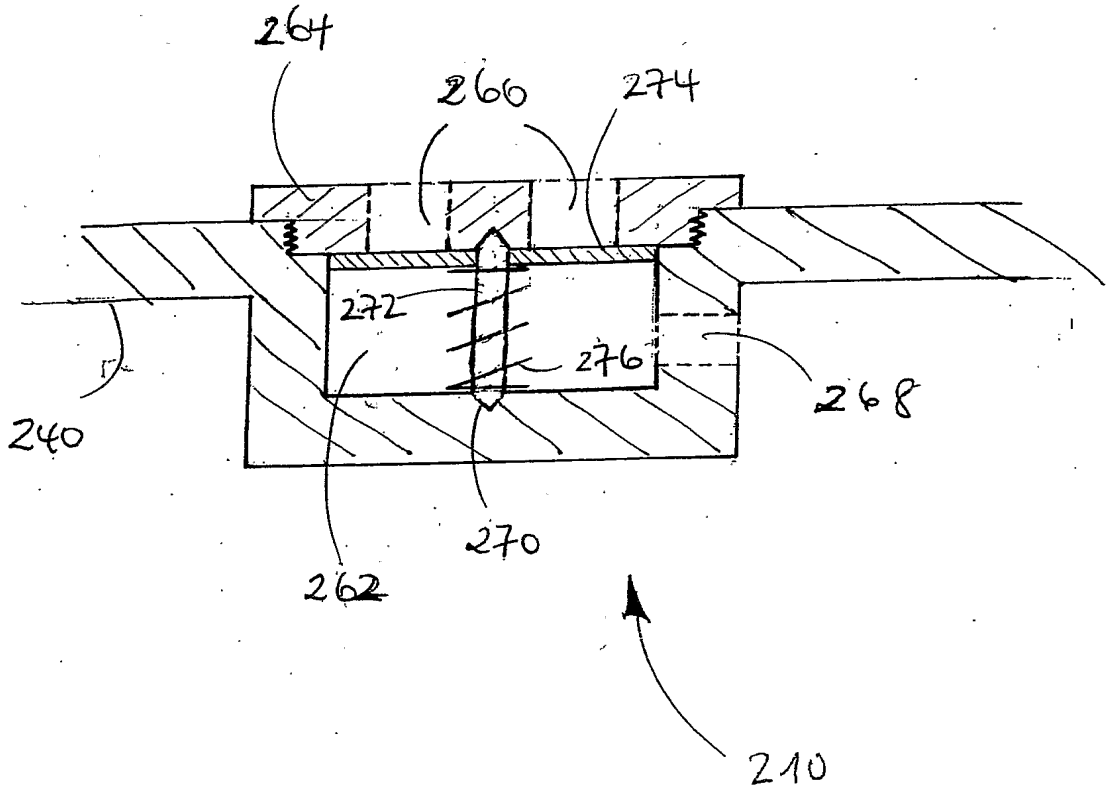


Fig. 17

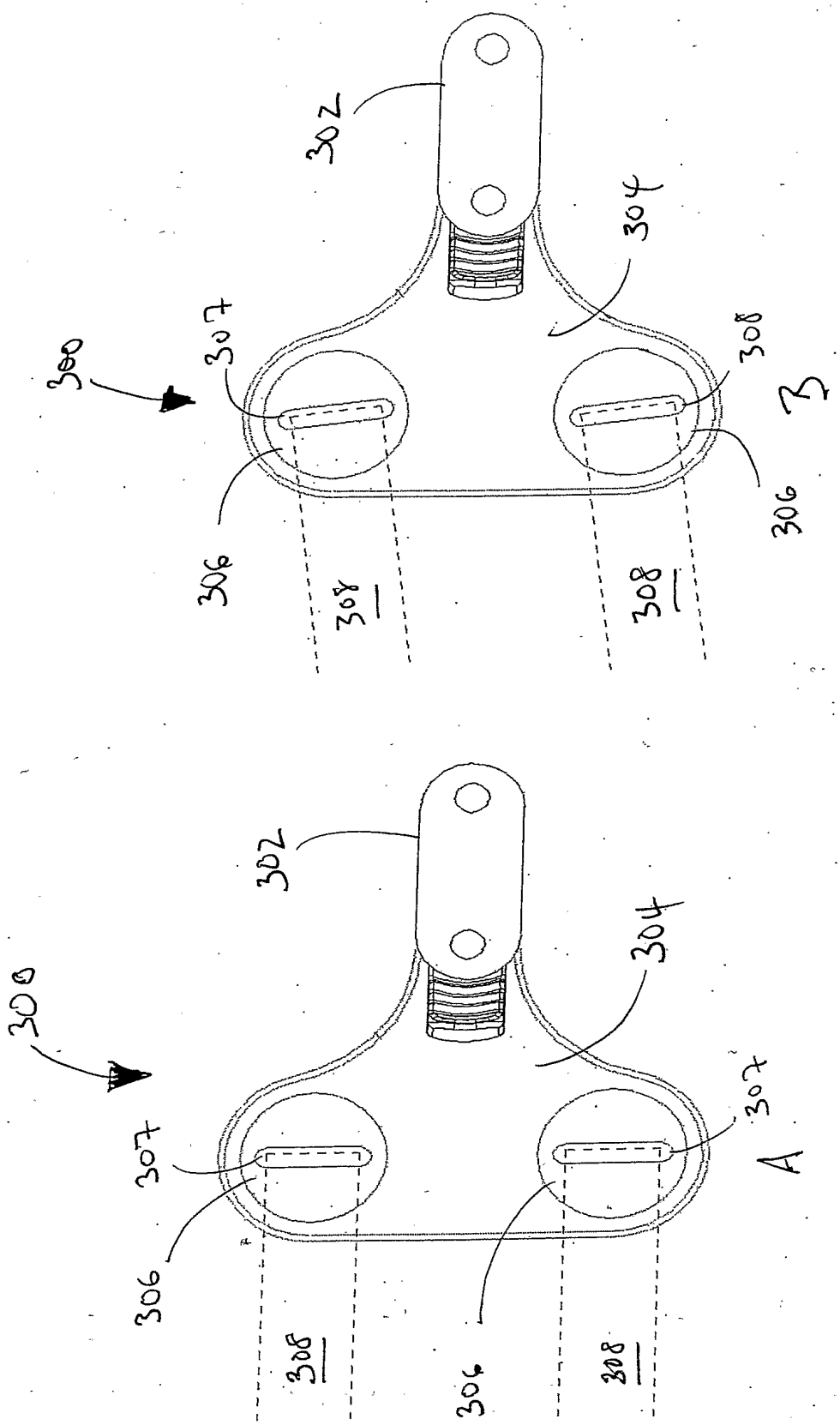


Fig 18

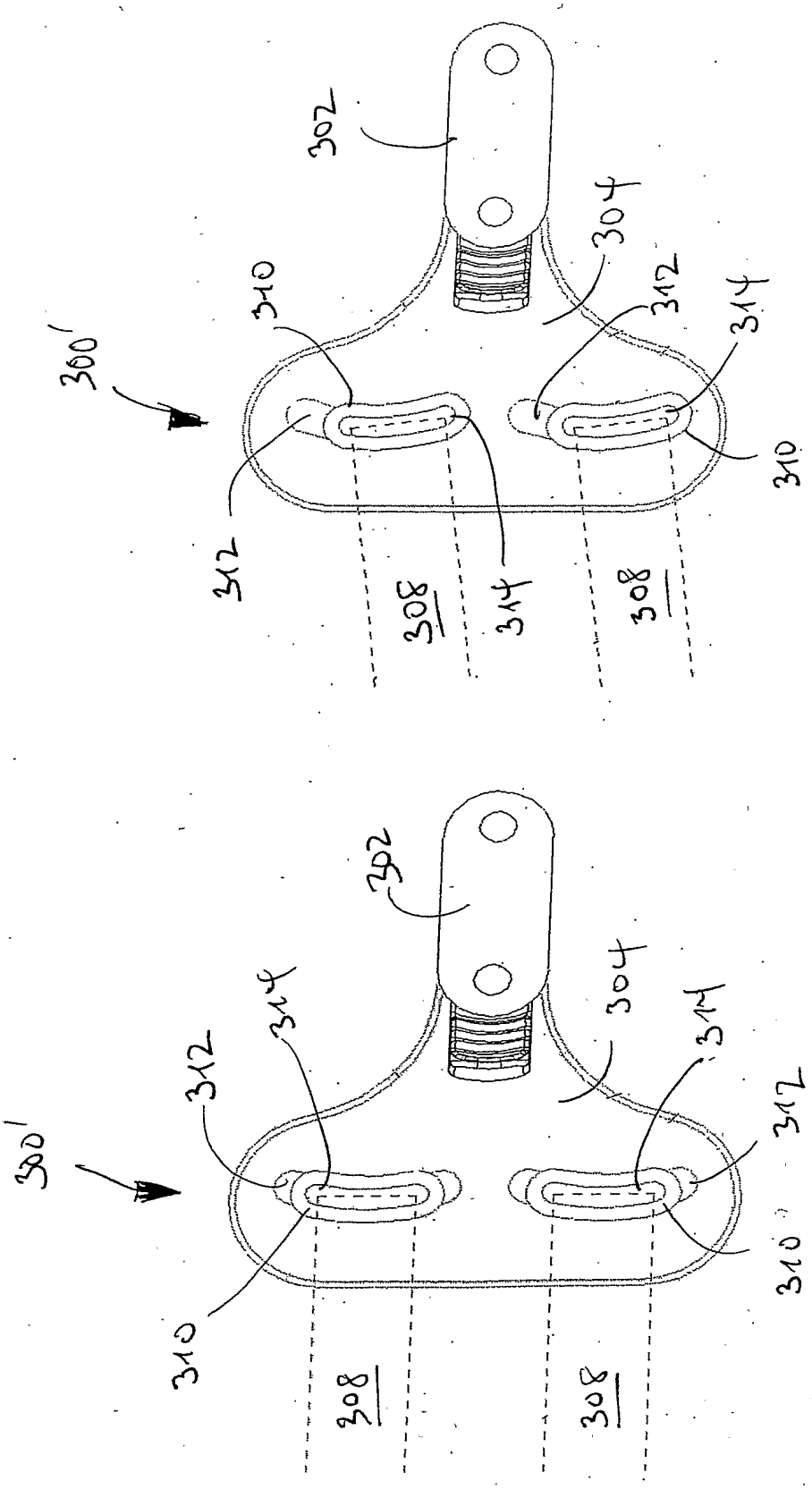


Fig. 19

Fig. 20A

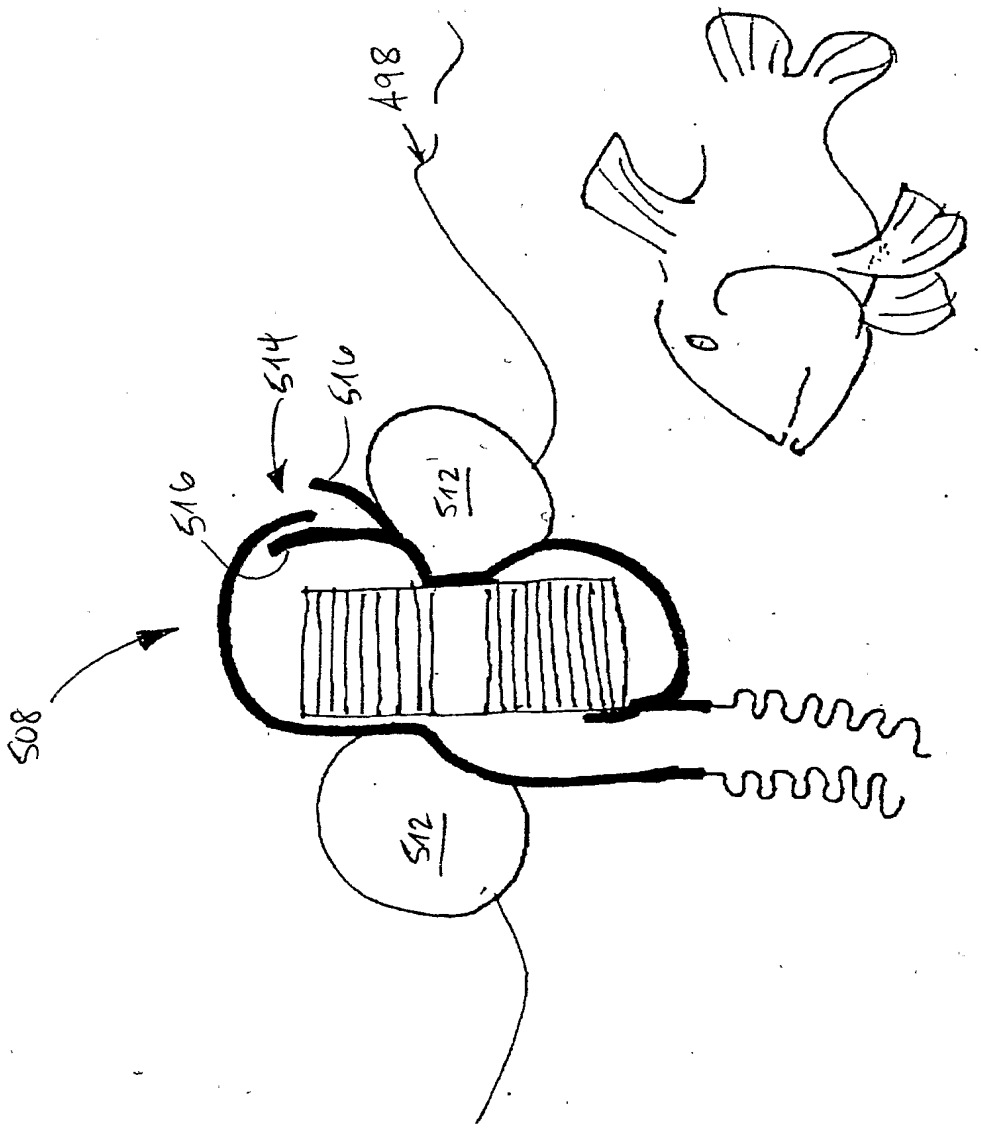


Fig. 20B